Commercial Wool Production in Communal Areas of South Africa: A Case Study of Two Communal Areas of the Eastern Cape Province of South Africa

by

Lunathi Kamvelihle Hlakanyane

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Supervisor: Prof JF Kirsten

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Declaration

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Abstract

Agricultural production is an integral livelihood strategy for households living in communal areas of South Africa where resource constraints and meagre economic conditions prevail. The commercialization of farming operations in communal areas provides a pathway through which poverty and other socioeconomic conditions may be alleviated. Agricultural commercialization achieves this by shifting production away from subsistence to commercial farming, which accelerates economic growth, creates employment opportunities and reduces rural unemployment. In 1997, the National Woolgrowers Association (NWGA) launched the LandCare initiative in previously disadvantaged communal areas of the Eastern Cape province. The LandCare initiative was implemented as an intervention strategy to eradicate endemic poverty in communal land areas through mass commercialization of wool production.

Literature has provided an in-depth account of the role of the NWGA in the evolution of wool commercialization in communal areas. The consensus is that NWGA's LandCare intervention resulted in general improvements in the volume of wool produced and prices received by woolgrowers in communal areas. Nevertheless, little research has been done to account for factors that determine progressions in dynamics of wool production among beneficiaries of the intervention. There is a need, therefore, to establish factors that determine increased commercialization of wool production in communal areas of the Eastern Cape that are beneficiaries of the NWGA LandCare intervention. The overall objective of this study was two-fold: to investigate changes over time in wool production, wool productivity and herd size, and investigate the relationship between woolgrower's demographic characteristics and wool production, productivity and herd size in communal areas of the Eastern Cape that are beneficiaries of the NWGA intervention.

The study uses data collected in the Allen Waters and Ensaam areas of the Eastern Cape. Both villages are constituents of the region informally referred to as the "wool belt."

In addition, secondary data was obtained from Boere Makelaaars Beperk (BKB) (Pty) Ltd, the nationwide wool brokerage firm that is also the primary marketing outlet for wool produced in these areas.

The study used a combination of descriptive and regression techniques to establish that advancements in the commercialization of wool production by beneficiaries of NWGA's Landcare intervention at communal areas of the Eastern Cape was a function of inherent differences in demographic characteristics. The study observed that the evolution of wool production commercialization in communal areas of the Eastern Cape was significantly prominent among households with higher total

household income, whose heads had retired from the off-farm labour market, possess formal education qualifications, and engaged in wool production on a full-time basis.

Acknowledgments

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Secondly, I want to thank Allen Waters and Ensaam Shearing Shed Associations for their unwavering cooperation over the duration of this study. Furthermore, I would like to extend my gratitude to Zindlovu Mdlalo from BKB (Pty) Ltd, and Sibusiso Ndwanya from NWGA for their incredible insight and support.

I would be remiss if I did not acknowledge the role played by the following individuals in the development of this study and my academic career: Martin Mwale and Onesmo McKenzie. Thank you for your constructive advice and encouragement.

Finally, I dedicate this thesis to my dear mother, Victress Noloyiso Nondela, who is the centre of my universe and a daily reminder of all that is good in this world. You are, and have always been, the wind beneath my wings. *Ndibamba ngazo zozibini, MaNgwanya.*

"*All that I am, or hope to be, I owe to my mother*." — Abraham Lincoln

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List of Acronyms and Abbreviations

ARC	Agricultural Research Council
AgriSETA	Agricultural Sector Education Training Authority
BKB (Pty) Ltd	Boere Makelaars Beperk (BKB) (Pty) Ltd.
BKS	Backs wool type
CDS	Centre for Development Support
c/kg	Cents per kilogram
DAFF	Department of Agriculture, Forestry, and Fisheries
ECP	Eastern Cape Province
FOB	Free-on-board value
F	Fine wool type
FF	Superfine wool type
g	grams
ICT	Information Communication Technology
kg	kilograms
LOX	Locks wool type
mm	millimetres
M	Medium wool type
NDA	National Development Agency
NGWA	National Woolgrowers Association
S	Strong wool
SS	Overstrong wool type
VAT	Value added tax

CHAPTER 1: INTRODUCTION

1.1 Background

Agricultural production is an integral livelihood strategy for households in communal areas of South Africa where resource constraints and meagre economic conditions prevail. The commercialisation of existing farming operations in these areas provides a pathway to alleviate poverty and other challenging socioeconomic conditions. There are varied definitions of agricultural commercialisation in literature with scholars providing different perspectives. Researchers (Govereh, Jayne, and Nyoro., 1999; Okezie, Nwonso, and Okezie, 2008) insist on defining agricultural commercialisation based on the size of the household's marketed output, while some (Kennedy and Cogill, 1987) premise the definition on increased production of cash-crops, irrespective of the marketed volume. Meanwhile, others (Brush and Turners, 1987; von Braun and Kenny, 1994; Pingali and Rosegrant, 1995) argue agricultural commercialisation occurs only when there is a systematic transition from subsistence to commercial production through specialized farming units.

Despite the divergence in the conceptualization of agricultural commercialisation, Kirsten, D'Haese, Calus, van Huylenbroeck, and Bostyn (2012) insist the definition encapsulating the transition from subsistence farming to commercial agriculture is fundamentally relevant as it signals structural transformation.

The authors (Kirsten, Mapila and Okello, 2012) define agricultural commercialisation as "the process in which farmers increase their productivity by producing more output per unit of land (and labour), produce greater surpluses which can be sold in the market, and thus increase their market participation with a beneficial outcome of higher incomes and living standards."

Elakanyani (2017) and Kibirige (2016) substantiate this definition by arguing that agricultural commercialisation results in a production shift away from traditional commodities to market-demanded commodities. This accelerates economic growth, creates employment opportunities and reduces rural unemployment. Furthermore, agricultural commercialisation enhances social capital by creating societal networks and cooperatives that consolidate knowledge, finances, skills, experience, and manage natural resources to gain a competitive advantage in the formal market (Elakanyani and Kibirige, 2016).

At the macro level, agricultural commercialisation is central to the structural transformation process, indicating a transition from a semi-agrarian society to an income-diversified and food secure economy with improved living standards. Thus, agricultural commercialisation has been central to institutional interventions aimed at alleviating poverty and unemployment in communal areas of South Africa post the democratic era.

In an effort to foster an inclusive and sustainable wool industry, the National Wool Growers Association (NWGA) implemented a developmental intervention in communal areas of South Africa to improve households' returns from wool production through the LandCare wool commercialisation program. The LandCare program sought to achieve this aim by optimizing the competitive potential of existing farm operations in communal areas through forming linkages with formal marketing channels. The first task of the intervention was aligning the standard of wool produced by woolgrowers in communal areas with international wool market requirements. The price of wool in the formal market is a function of a wide range of characteristics including wool length, fineness, and quality. Wool length is divided into nine categories according to length. The combination of wool length and wool finess determines the value of wool fleece.

Table 1.1: Wool length classification

Description	Length (minimum length)
AA	90 mm+
A	80-90 mm
BB	70-80 mm
B	60-70 mm
C	50-60 mm
DD	40-50 mm
D	30-40 mm
EE	20-30
E	Less than 20 mm

Source: NWGA (2020)

A price disparity exists between the varying wool lengths according to their end-use in trade. For example, wool longer than 50mm is used for worsted yarn in the manufacture of suits and jackets. Meanwhile, short wool (≤ 50mm) consists of fibres used for blankets and felt products (NWGA, 2020).

Similarly, wool fineness is a central price-determining characteristic of the wool clip. Wool fineness is measured in microns (µ) equivalent to 1/1000 of mm and denotes fibre diameter. Fibre diameter plays a crucial role in determining worsted processing performance, value of the wool clip and as well as its price at auction (Botha and Hunter, 2010). The value of fibre diameter alone accounts for as much as 70-80% of the price received at auction for greasy wool (Botha and Hunter, 2010). In this regard, wool fineness and quality are indistinguishable from each other as finer wools indicate a product of higher quality standards. The South African wool industry's breeding policy requires farmers to adhere to the Deurden Standard when measuring wool fineness. This is done by determining the number of crimps per 25 mm, wherein the higher the number of crimps per 25 mm the finer the wool.

Table 1.2: Wool fineness classification

Description	**Fineness Symbol**	**Micron – µ**	**Deurden – Amount crimps/25mm**
Superfine	FF	19 and finer	16>
Fine	F	19.1 – 20	13 – 15
Medium	M	20.1 – 22	11-13
Strong	S	22.1 – 24	8 – 10
Overstrong	SS	24.1 – 27	<7

Source: NWGA (2019)

The Deurden classification standard differentiates wool fibre diameter from superfine to overstrong. Wools with less than 16 amounts of cramps per 25 mm or ≦ 19 microns (µ) are classified as superfine and denoted by the symbol, FF. While wools with less than 7 amounts of crimps per 25 mm or between 24.1 - 27 microns (µ), are classified as superstrong and denoted by the symbol, SS.

As both wool length and fineness are functions of animal husbandry, shearing conditions, as well as proper wool classing and sorting, the NWGA was commissioned to provide technical advice, facilitate infrastructural development, and preside over the construction of shearing sheds in communal areas of the Eastern Cape Province (D'Haese, van Huylenbroeck, Bontinck, Calus, Coppens, De Clercq, Delanoy, De Smet, Poot and Bostyn, 2003)

De Beer and Terblanché (2015) state that before the intervention, woolgrowers in communal areas produced a total of 222,610 kilograms of wool valued at R1.5 million in the 1997/1998 season. However, twenty one years after the initial engagement this figure had increased to 4,7 million kilograms produced with an estimated value of R336,98 million by the end of the 2018/2019 season (NWGA, 2020).

Table 1.3: Wool marketed by communal woolgrowers (1997-2019)

Season	Production (kg)	Value (Rands)	National Price (C/Kg)	Communal Price (C/Kg)
1997/1998	222.61	1 502 908	1 225	675
1999/2000	336.70	1 965 557	1 102	584
2001/2002	535.91	6927 640	22 77	1,293
2003/2004	2,029.56	17 768 955	2 109	876
2008/2009	2,666.93	43 149 706	2 548	1,618
2009/2010	2,807.16	64 676 989	3 222	2,304
2012/2013	3,461.94	131 842 578	5 537	3,803
2013/2014	3,806.99	137 919 368	6 016	3,623
2014/2015	3,582.12	130 849 388	6 863	3,652
2015/2016	4,462.09	233 618 025	7 668	5,235
2016/2017	5,812.64	299 882 008	8 156	5,159
2017/2018	5,422.12	383 607 431	9 967	7 075
2018/2019	4,737.00	336,9798.27	11 260	7 114

Source: NWGA (2020)

Jordaan (2011) notes that the intervention resulted in a fifty-fold increase in wool profits, triggering a 30% increase in the previously unexploited value of sheep produced by smallholder farmers in communal areas, which enabled woolgrowers in these regions to supply between 10-20% of South Africa's total wool production.

To date, 92% of South Africa's total wool clip is produced in four provinces, namely the Eastern Cape, Free State, Western Cape and Northern Cape, as illustrated by Figure 1.1. South Africa's total wool clip in the 2018/2019 season was 44.3 million kg.

The Eastern Cape, with the highest number of sheep in the country at 6.6 million heads, accounts for 39% of the output followed by Free State (23%), Western Cape (17%), as well as Northern Cape (13%)

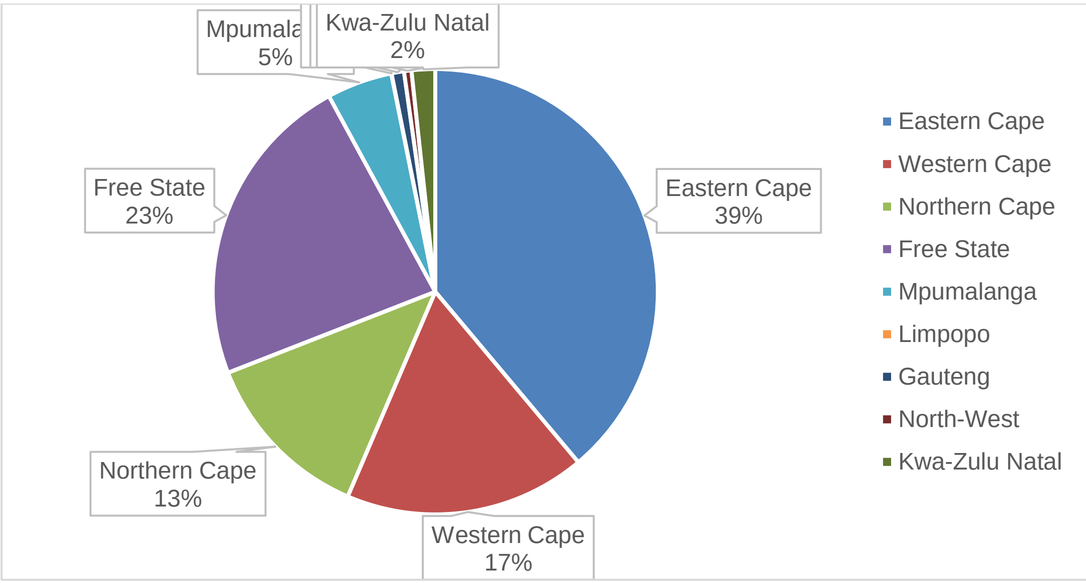

Figure 1.1: Wool production by province (2018/2019)
Source: Cape Wools (2020)

The vertical integration of communal woolgrowers into the formal marketing channel allows resource-poor farmers to earn foreign income from exports earnings as South Africa is a net exporter of wool. In the 2018/2019 season, South Africa exported 97.02% in weight and 97.01% in value of all wool produced (Cape Wools, 2020).

Table 1.4: South African wool exports: 2018/2019 season

All Greasy Wool Exports: 2018/2019 Wool Season					
Country	**Grease**		**Total**	**% Contribution**	
	R	**Kg**	**R**	**FOB Value**	**Mass (Kg)**
China/Macau	1 994 885 775	16 081 043	1 994 885 775	44%	54%
Czech Republic	1 656 335 729	8 784 864	1 656 335 729	37%	30%
Italy	268 893 752	1 632 311	363 752 989	8%	5%
India	231 782 129	1 409 941	233 281 074	5%	5%
Bulgaria	135 117 540	1 314 091	135 117 540	3%	4%
Other	73 812 781	548 874	111 840 686	2%	2%
Total	4 360 827 706	29 771 123	4 495 213 793	100%	100%

Source: Cape Wools (2020)

Wool production data indicate that South Africa is a net exporter of greasy wool, with 29 771 123 kilograms of greasy wool exported during the 2018/2019 season at a total free-on-board (FOB) value of R4.3 billion (Cape Wools, 2020). This constitutes a 97% market share on the total value of total wool exports of R4.3 billion in the 2018/2019 season (Cape Wools, 2020). As illustrated in Table 1.4, China is the largest importer of South African wool. In the 2018/2019 season, China received 44% in value and 54% in volume of South Africa's total wool shipment. Other top importers of South Africa's wool clip include Czech Republic (36.6%), Italy (8%), India (5.2%) as well as Bulgaria (3%), according to Cape Wools (2020).The wool not exported is scoured and combed into tops, then consumed domestically.

South Africa's wool value chain is quintessential within the agricultural industry. It is characterized by multiple transformation stages, extended lead times and geographical dispersion of production, processing, manufacturing, and consumption (Jordaan, 2011). South African woolgrowers mainly produces the Merino clip, which comprises more than 90% of all lots traded in the weekly auction market (Cape wools, 2020).

All wool marketed through the formal marketing channel is traded via the open-outcry auction system. The auction is held in Nelson Mandela Bay in the Eastern Cape over a ten-month period from August of the current year to June of the next year (Dreyer, 2019). The wool auction system is characterized by a low buyer to seller ration, where a few buyers often compete over numerous auctions to meet their market's specifications in terms of price, volume, and quality.

The global price for apparel wool is driven by the Australian wool industry, where the highest volume of all wool traded in the global wool market is produced. Thus, in the global trade context, South Africa is a market follower (Dreyer, 2019)

The price of wool is a function of range of multifaceted variables including exchange rate fluctuations, size of the market in Australia, prevailing demand for specific wool types, quantities on offer for sale at auctions, demand specifications on delivery times, as well as the economic climate in main wool-producing countries (D'Haese, Huylenbroeck, Doyer, Calus, 2007). Above all these factors, the prime price determinant of the value of wool is mean fibre diameter. Wools of finer micron category command a higher price at auction than those of medium or strong types (Jordaan, 2011)

In this regard, the NWGA intervention sought to increase the competitiveness of wool produced in communal areas through breeding and management techniques that yield a product of finer fibre diameter. The outcome of the wide scale adoption of these techniques by woolgrowers in communal areas contributed immensely to South Africa's aggregate wool mean fibre diameter, which predominantly falls within the medium-fine category.

Table 1.5: South African wool micron distributing: 2018/2019 season

ALL WOOL MICRON DISTRIBUTION																	
	≤17.0µ	**17.5µ**	**18.0µ**	**18.5µ**	**19.0µ**	**19.5µ**	**20.0µ**	**20.5µ**	**21.0µ**	**21.5µ**	**22.0µ**	**22.5µ**	**23.0µ**	**23.5µ**	**24.0µ**	**24.5µ**	**≥25.0µ**	**Tot**
%	2%	3%	6%	8%	12%	14%	16%	13%	9%	5%	4%	3%	2%	1%	1%	0%	0%	100

Source: NWGA (2018)

As illustrated by Table 1.5, 45% of South Africa's wool clip in the 2018/2019 season tested finer than 20µ, while 47% tested between 20-22µ (Cape Wools, 2020). This vast improvement in the quality of South Africa's wool output culminated in an increase of the average price of wool received per kilogram. Cape Wools (2020) reports that the average Merino indictor for the 2018/2019 season closed at R217,90/kg (clean), which was 17.13% higher than the average price received for the previous season. The increase in the overall average wool price per kilogram received is to a large measure, due to the success of NWGA's intervention to foster a unified South African wool industry underpinned by shared breeding, shearing, classing, and quality standards.

1.3 Research problem and research questions

Analytical evidence from various studies (De Beer & Terblanché, 2015; Dreyer 2019) has revealed that efforts to promote the commercialization of wool production in communal areas of the Eastern Cape province have resulted in positive outcomes. The literature (De Beer & Terblanché, 2015; D'Haese *et al.*, 2001; Perret, 2002; Jordaan, 2011) has made a strong case to account for the role of institutional interventions, such as the National Woolgrowers Association's LandCare program, in the evolution of wool production as well as improvements in income derived from the sale of wool communal areas of the Eastern Cape. However, literature has not adequately provided an account of specific factors that determine the evolution of wool production in communal areas of the Eastern Cape.

In response to this gap in literature, this study seeks to provide a descriptive analysis of the socioeconomic demographic characteristics that influence the evolution of commercial wool production among woolgrowers in communal areas of the Eastern Cape. The analysis of these descriptive statistics permits a comprehensive overview of how different demographic characteristics influence the outcome of institutional interventions. The value of such analytical insight is that it allows for the development of a customized developmental framework for each demographic category in order to optimize the outcome of the intervention. In light of this aim, the study seeks to unpack the following set of research questions:

- What is the nature of the change in total wool production, wool productivity per sheep, and total herd size in communal areas of Eastern Cape?
- What is the relationship between woolgrowers' socioeconomic characteristics and total wool production per woolgrower, wool productivity per sheep and total herd size per woolgrower in the communal areas of the Eastern Cape?

1.4 Hypothesis

Efforts to commercialise wool production in communal areas of the Eastern Cape had different outcomes for different segments of the population and these differences were divided along socioeconomic dynamics.

Wool productivity is one of such outcomes that varied among woolgrowers in the post implementation of the intervention. Since wool productivity is, to a large measure, a function of appropriate sheep management techniques, male woolgrowers have a higher wool productivity per sheep index than female woolgrowers since female woolgrowers' activities tend to be divided between household responsibilities and farming operations. By contrast, male woolgrowers are likely to allocate more time to improving their sheep management techniques through attending intervention sessions, thereby improving total wool production, generally; and wool productivity per sheep, specifically.

1.5 Study area and research methodology

The study seeks to describe the socioeconomic factors that determine the progression of wool production in communal areas of the Eastern Cape that were beneficiaries of the National Woolgrowers association's LandCare intervention. The primary focus of the study, therefore, is wool growers of Allen Waters and Ensaam communities at the Enoch Mgijima Local Municipality located in the former Ciskei area of the Eastern Cape Province of South Africa.

Due to the nature of the study's research question and the composition of the data collected, the study employs both qualitative and quantitative methods to allow an in-depth analysis necessary for the achievement of the main objectives. A qualitative method enables a comprehensive description of the natural phenomena as it occurs in the data. It explores and investigates through detailed contextual analysis of a limited number of events or conditions, and their relationships (Zainal, 2007).

While the qualitative method reveals the links in the data through graphs, figures, and trend exhibitions, quantitative analysis can inform the significance of the observed relationships and trends. The study includes both methodologies to strengthen the robustness of its findings and discussions.

The population under observation was communal sheep farmers of Allen Waters village and Ensaam village at Whittlesea and Queenstown, respectively. As previously alluded, the two areas are situated in the Enoch Mgijima Local Municipality of the Eastern Cape Province. A representative sample of 123 communal wool growers who were active participants of the NWGA's shearing shed scheme served as the unit of analysis. A cross-sectional study was conducted, wherein beneficiaries of the intervention were surveyed. A purposive or selective study was added and data relating to characteristics of wool production and household living standards collected and analysed.

1.6 Delimitations

The study explores the factors that determine the evolution of commercial wool production in communal areas of the Eastern Cape post the National Woolgrowers Association’s intervention to promote sustainable wool commercialisation.

However, due to resource and time constraints, the study is restricted to the communal woolgrowers of Allen Waters and Ensaam. It is therefore important not to attempt to apply the findings of this study to the general population or to replicate the results in other areas. In addition, it is important to note that all survey respondents participated in the wool commercialisation intervention because all the farmers in the study were beneficiaries of the NWGA intervention through its communal shearing shed scheme. These sheep farmers constituted the treatment group. However, as all farmers surveyed as part of this study were beneficiaries of NWGA’s intervention strategy, the study lacked a control group — that is, sheep farmers who did not participate in the intervention scheme. The absence of a control group limits the degree to which the impact of the NWGA intervention program on household living standards may be analysed by comparing participants of the intervention with non-participants.

This study, therefore, only captures the differences in characteristics of interest with respect to the variations in the proportion of wool produced across the subjects over time without a comparison to a control group. Moreover, due to inconsistencies in historical data, the wool production and wool revenue figures captured in the data are restricted to a five-year period, from 2013 to 2017.

The immediate implication of such restriction is that it limits a robust analysis of trends in wool produced, productivity per sheep, and revenue accrued by woolgrowers at the two study areas, Allen Waters and Ensaam, since the inception of the intervention in 1998.

1.7 Outline of the study

Chapter 1 is followed in Chapter 2 by a review of agricultural growth and development in communal areas of the Eastern Cape. Chapter 2 describes the history of wool production in communal areas of the Eastern Cape; the cultural, economic and social role of livestock in communal areas; as well as the National Woolgrowers Association's institutional intervention to promote agricultural growth and commercialization. In addition, Chapter 2 presents the General characteristics of the two study case areas. Chapter 3 provides a detailed description of the survey, data and methods used in the study, while Chapter 4 provides analysis of progressions in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower in the two case study areas. Analysis of changes in total wool production, wool productivity per sheep and total herd size across different sociodemographic characteristics are presented in Chapter 5, while Chapter 6 provides the conclusion and recommendations.

CHAPTER 2: AGRICULTURAL DEVELOPMENT AND GROWTH IN COMMUNAL AREAS OF THE EASTERN CAPE

2.1 Introduction

This chapter presents a comprehensive overview of the dynamics of agricultural development and growth in communal areas of the Eastern Cape province of South Africa. The chapter begins with a detailed literature review of the history of wool production in communal areas of the Eastern Cape, from the arrival of the first flock of Merino breeds in 1789 (Jordaan, 2011); its distribution to the Highveld during the Great Trek of 1834 (Merino, 2008); to the commodification of wool in communal areas as a household income diversification strategy.

The multifaceted role of livestock in the social, economic, and cultural landscape of communal areas of the Eastern Cape is also reviewed with detailed insights into the relationship each variable shares with livestock, and indeed sheep, production in communal areas of the Eastern Cape.

The final theme of this chapter explores the National Wool Growers Association's LandCare intervention, which leveraged the role of livestock in communal areas to promote the commercialisation of wool production. Lastly, the general characteristics, as well as practices governing wool production at the two woolsheds, Allen Waters and Ensaam, selected for the evaluation of the study's main aim are described in detail.

2.2 The history of wool production in the communal land areas of the Eastern Cape

The history of sheep domestication and mass production in South Africa is evident in the literature (Jordaan, 2011; D'Haese, *et al.,* 2003). In 1789, South Africa became the first country outside of Europe to possess merino sheep when the Dutch government leased two Spanish rams and four ewes to the Cape Colony for experimental purposes (Jordaan, 2011).

The Spanish merino sheep had initially been a donation to the House of Orange by the Spanish King, whose prerogatives included sole ownership of the rights to export merino sheep (Merino SA, 2008). The high rainfall and damp climate of Holland made it difficult for merino to adapt, which prompted the Dutch government to send two rams and four ewes to the Cape Colony (Merino SA, 2008).

The potential of merino sheep as a source of nutritional sustenance and a store of wealth soon became evident. By 1830, the production of this breed had been well-established in the Western and Southern Capes (Merino SA, 2008).

Jordaan (2011) adds that the spread of merino sheep during this period was due, in part, to the breed's adaptability to South Africa's agro-ecological zones.

The most noteworthy spread of merino sheep, however, occurred in 1834 during the Great Trek, as Voortrekkers were migrating Northward with their flocks in search of fertile lands (Merino SA, 2008). Jordaan (2011) asserted that as a result, an estimated half of the population of sheep in the country is in semi-arid areas, which constitute 85% of the total land surface area.

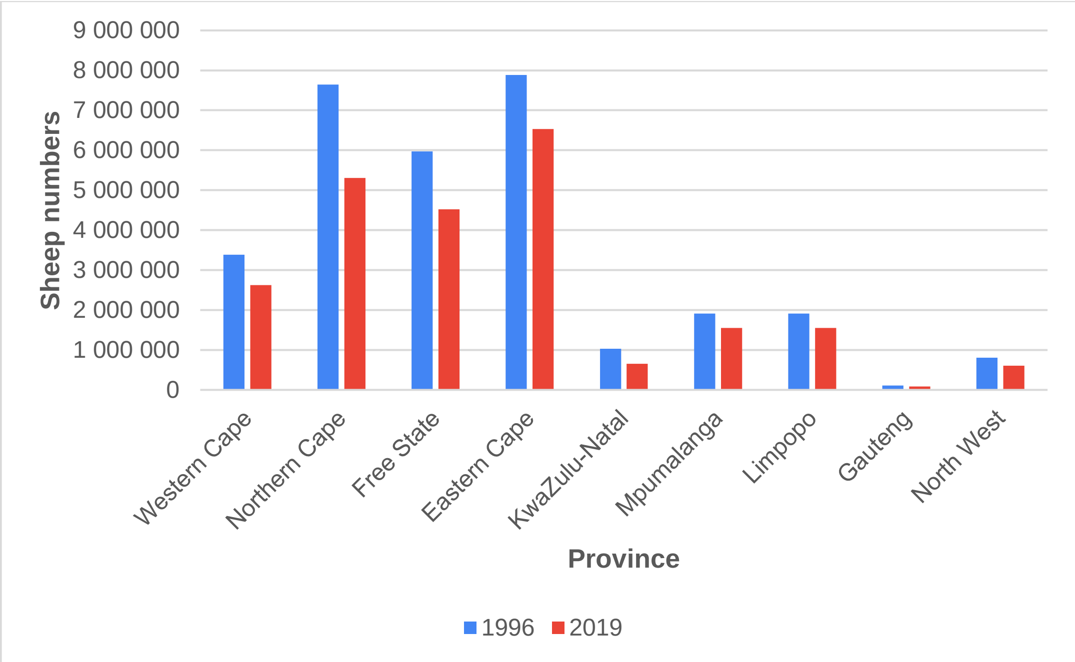

Figure 2.1: Sheep numbers per province – 1996 vs 2019
Source: DAFF (2019)

The Eastern Cape had a fundamental role in the adoption of sheep in South Africa. As illustrated in Figure 2.1, in 1996 the province had a total stock count of 7.9 million sheep (DAFF, 2018). Although this number has since declined to 6.5 million sheep in 2019, Figure 2.1 shows that the province has consistently had the highest number of sheep in South Africa for the past two decades.

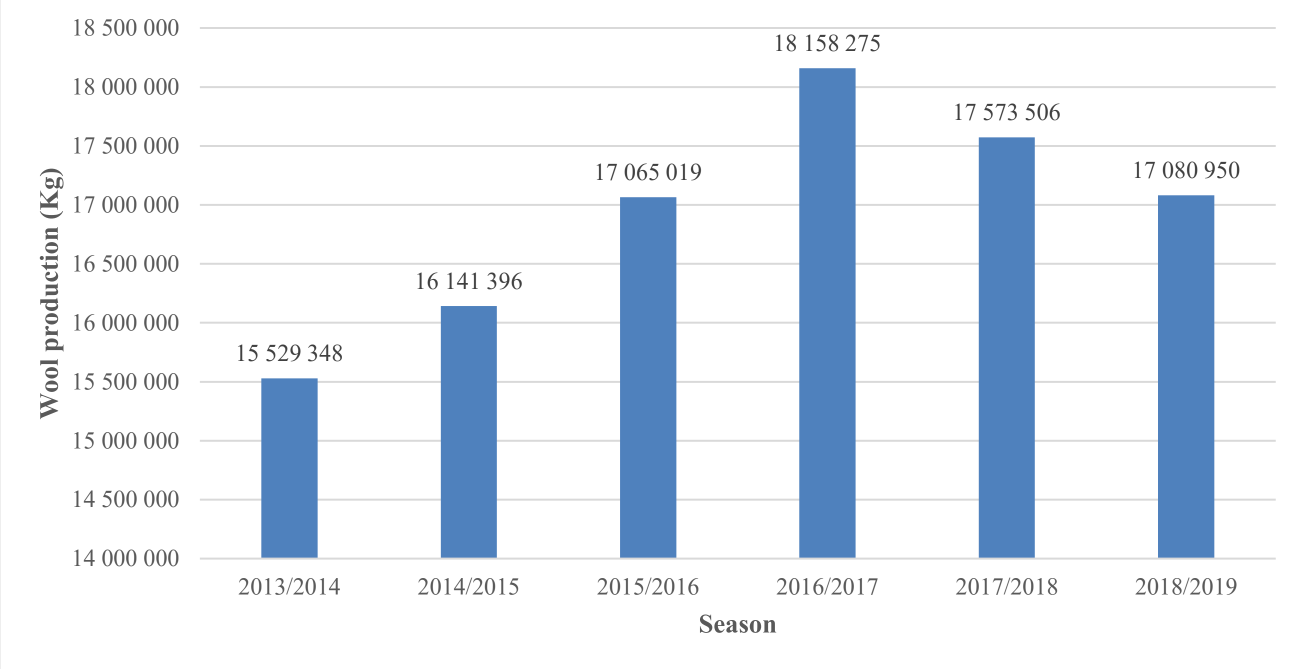

Figure 2.2: Eastern Cape wool production trend: 2013 - 2019
Source: DAFF (2019)

Naturally, the Eastern Cape is also the largest producer of wool in the country, as the province accounted for 17.1 million kilograms of the 48.9 million produced in South Africa in the 2018/2019 season (Cape Wools, 2019). The increase in the volume of wool produced in South Africa is in line with a similar increase in the proportion of wool grown in communal areas and marketed through the formal market. However, this has not always been the case. Traditionally, wool grown in communal areas was marketed through informal channels.

Historically, communal woolgrowers sold their clips of mostly poor quality to private brokers through an informal market channel. The prices were determined by the brokers and did not necessarily reflect prevailing formal market prices. Due to market information asymmetry and high transportation costs, private brokers often subjected farmers to below-market prices, according to Jordaan (2011). Communal woolgrowers conducted shearing in the household under poor, unhygienic conditions, where the wool was unclassed, poorly packaged, and then sold at the farm gate to private wool brokers (D'Haese, *et al.*, 2003). The CDS (2005) reports that the communal farmers' profits were R2.50 per kilogram, which was substantially lower than the price of R20 per kilogram and R30 per kilogram accrued by their commercial counterparts.

Nonetheless, the private brokers added value to the clip by classing, baling, and transporting it to the formal market where it was sold at considerably higher prices relative to the price received by communal woolgrowers (Jordaan, 2013).

This form of informal marketing channel is one of the major reasons cited by scholars (Jordaan, 2013; D'Haese *et al*., 2003; Perret, 2002) for low-price returns for communal woolgrowers.

In addition to an informal marketing channel, there were numerous other institutional and technical constraints to wool production in communal areas of the Eastern Cape, including lack of marketing information, poor infrastructure, lower wool price, poor quality and stock theft (S. Perret, 2002; D'Haese *et al*., 2003).

The following factors restricted optimum wool production in communal areas:

- *Lack of marketing information* — The insufficiency of market information available to communal woolgrowers made them particularly vulnerable to predatory trading practices that led to farmers falling short of realising full value for their produce. It discouraged investment in wool production for farmers, according to Jordaan (2011).

- *Poor infrastructure* — The absence of economic, social, and institutional infrastructure impeded optimum wool production in many communal land areas that did not receive exogenous support. Consequently, many wool-growing communities in the Eastern Cape were prone to producing sheep of poor genetic quality. Some of the reasons for such poor quality included inbreeding, unsustainable grazing veld management practices largely due to a disincentive to invest in feed pastures as well as unhygienic shearing conditions due to a lack of training on efficient production techniques (Jordaan, 2011; D'Haese *et al*., 2003).

- *Lower wool price* — The high transaction costs inherent to wool production in rural areas *de facto* made the informal channel the only outlet available for communal woolgrowers to market their produce. Since there are no clear standards governing trade in this channel, private wool brokers were the main price-setters. They offered communal sheep farmers prices not determined by market indicators, which were often very low. Jordaan (2011) argues that low returns to investment as a result of predatory trading practices in the informal marketing channel is a disincentive for optimum wool production and, by definition, a sustainable wool economy.

- *Livestock theft* — The pervasiveness of livestock theft in communal areas of the Eastern Cape was in part because communal grazing pastures were neither fenced off nor divided into camps. This left the sheep free to roam about without being shepherded or brought into the fold at night.

Moreover, poor marking or branding of sheep, such as with easily removable paint markings, made sheep particularly vulnerable to theft (D'Haese *et al.*, 2003; Maluleke, Mokwena and Motsepe, 2016).

Despite these entrenched constraints, sheep farming continues to play a cardinal role in the livelihood of rural households. This role forms part of a wider function of livestock production in communal areas.

2.3 The role of livestock production in communal areas

Livestock farming in communal areas is one of the oldest farming systems in the world and still dominates many of the agricultural activities pursued by rural households across Africa, and indeed South Africa (Mmbengwa, Nyhodo, Myeke, Ngethu and Van Schalkwyk, 2015). Through its function to produce food and non-food items, livestock farming has emerged as an essential income diversification strategy for many households in communal areas (Dzivakwi, 2010).

There are approximately 52.6 million poor livestock keepers in communal areas of the Southern African region who depend on livestock for their livelihood (Gwiriri, Bennet, Mapiye, Marandure and Burbi, 2019). An estimated 90% of livestock farmers in Southern Africa are categorised as smallholder farmers who reportedly own 75% of all livestock in the region (Gwiriri *et al.*, 2019). Livestock farming provides economic relief to vulnerable households in communal areas of Southern Africa through secondary economic linkages that enable participation in the formal market and, ultimately, the transition from subsistence to commercial agriculture (Mmbengwa, *et al.*, 2015).

In South Africa, the transition in question is underpinned by the finding that 69% of agricultural land is used for grazing on the natural veld, while in communal areas this figure is as high as 84%. This makes livestock farming, specifically, the sale of livestock products such as wool, one of the most commercially viable agricultural activities pursued in communal areas (Mthi, Skenjana and Fayemi, 2017; Mmbengwa *et al.*, 2015). Ngubane, Chimonyo and Kolanisi (2018) report that an estimated 70% of resource-poor farmers in South Africa are located in agro-ecological zones that restrict crop farming, thus livestock production is *de facto* the main agricultural activity in these areas (Ngubane, Chimonyo and Kolanisi, 2018). Mmbengwa *et al.*, (2015) support this claim by asserting that only 14% of the land in communal areas is suitable for crop production against 84% classified as grazing land.

The communal farming sector occupies 17% of the land suitable for livestock farming and accounts for an estimated 40% of the 13.4 million cattle available in South Africa (Gwiriri *et al.*, 2019). It is of little surprise, therefore, that 80% of the population residing in communal areas of the Eastern Cape is involved in integrated livestock farming systems, which predominantly consist of cattle, goats, and sheep (Mthi, Skenjana and Fayemi 2017). This is consistent with the finding that the aggregate national share of livestock owned by households in communal areas is 35% for cattle, 57% for goats, and 10% for sheep (Mmbengwa, *et al.*, 2015). In this regard, the Eastern Cape province has the highest concentration of cattle, goats, and sheep with 34.1%, 37.1%, and 65.6% respectively (Stats SA, 2016). The concentration of livestock in communal areas serves multiple purposes upon which rural livelihood strategies are premised.

Ngubane *et al.*, (2018) state that the most notable role of livestock in communal areas is its characteristic as an income-generating asset. (Ngubane *et al.*, 2018; Gwiriri *et al.*, 2019) have evidence of this, despite the off-take rate on cattle reared in communal areas being 5-10% compared to 25% in commercial farms. Nonetheless, the economic value of livestock in these areas constitutes what Cousins (1999) terms "invincible capital" due to its multidimensional purpose as a store of wealth and *ex-ante* risk-mitigating strategy. Van Rooyen (2008) and Magangana, Gantso, Mkhululi, Van Rooyen and Palmer (2015) substantiate this claim and add that the economic role of livestock in communal areas is food supply, cash-income generation, traction and fertilizer provision.

Livestock also act as a household portfolio diversification asset and accessible investment option. The sale of consumables derived from livestock is converted into cash greatly reducing a household's reliance on informal credit market loans (Shackleton, Shackleton, Netshiluvi and Mathabela, 2005; Bettencourt, 2015).

From a socio-cultural perspective, livestock plays a crucial role in communal areas. Van Rooyen (2008) argues that livestock enhances social networks, facilitates power relationships and is an important catalyst for gender balance. Livestock is central to traditional rituals, such as ancestral worship, and cultural practices, like bride worth or *lobola*, making it an indispensable asset to residents of communal areas (Shackleton *et al*., 2005). Furthermore, the herding of livestock into communal grazing pastures facilitates network links among farmers where ideas relating to innovative farming techniques are exchanged (Bettencourt, 2015). The multi-varied role of livestock in communal areas, as outlined above, has been a basis upon which institutional interventions aimed at commercialising livestock production have been premised.

2.4 National Woolgrowers Association of South Africa intervention to promote wool commercialisation in communal areas of Eastern Cape

There have been numerous technical and institutional interventions to promote agricultural development in communal areas of South Africa. Decades of selective institutional support had reduced these areas to what May (1998) terms "poverty traps with little or no agricultural development directed towards them. In an attempt to initiate much-needed agricultural reform, commodity organisations and the government embarked on a series of collaborative programs aimed at promoting agricultural development as a poverty-alleviating strategy at communal areas of South Africa.

The primary aim of these interventions was the elimination of a dual approach (Kirsten, Van Zyl and Van Rooyen, 1994) to agricultural development by the pre-democratic dispensation through linking resource-poor farmers in communal areas with formal marketing channels.

In the wool production industry, integration of resource-poor farmers into formal marketing channels became the prerogative of the National Woolgrowers Association (NWGA). To this end, NWGA implemented the LandCare intervention strategy in wool-producing communal areas of South Africa to foster a sustainable and united wool industry in South Africa.

Thus, the following section focuses on NWGA's effort to promote the commercialisation of wool production in communal areas of the Eastern Cape post the democratic era.

The National Woolgrowers Association (NWGA) was founded in 1926 as an organized entity that safeguards the interests of wool producers in South Africa. Since its inception, the main aim of the organisation was to "intergrade, in a single representative structure, the development requirements of the wool sector" (NWGA website, 2018). With the democratization of South Africa, which was accompanied by a series of agricultural reforms, the NWGA extended its main function to encompass the development of wool production in previously disadvantaged communal areas through a dispersing a wide range of training and advisory services.

According to De Beer and Terblanche (2015) advisory services provided by NWGA included predation and management training; farm business management; appropriate commercial wool production practices; improved sheep genetics; infrastructural development in the form of shearing sheds, fenced grazing areas; access to formal markets; as well as training sessions aimed at enhancing production, shearing, classing, animal health, breeding and selection management.

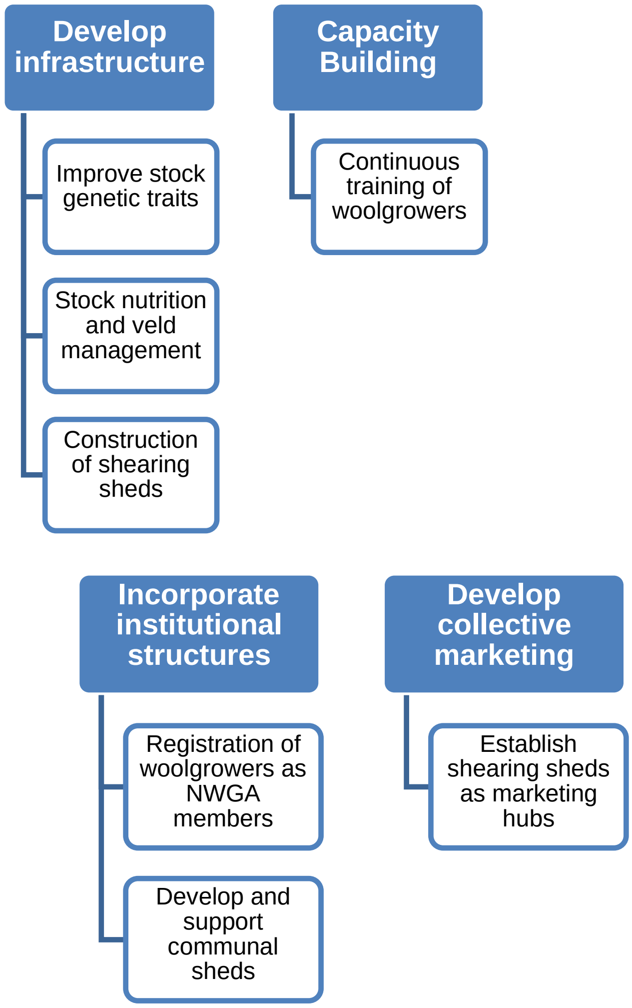

Figure 2.3: The four pillars of NWGA intervention
Source: Jordaan (2011)

The roles of each organisation in the execution of the program were clearly outlined by researchers (Jordaan, 2011). The NWGA was tasked with infrastructural development and coordinating the program, the National Development Agency was responsible for appointing extension officers as well as the provision of rams for the breeding program, and the Agricultural Research Council administered research-based technical support services, as illustrated by Figure 2.3.

The success of NWGA's LandCare program is well-documented in the literature (D'Haese *et al.*, 2003; CDS, 2005; Jordaan, 2011; and De Beer & Terblanché in 2015). De Beer and Terblanché (2015) note that prior to the intervention, communal woolgrowers marketed 222 610 kilograms of wool with an estimated value of R1 503 000.

However, twenty-one years after the initial engagement, this figure had risen to R336,97 million from the sale of 4.7 million kilograms of wool by the end of the 2018/2019 season, as illustrated by Figure

2.4. Although the national price of wool has remained relatively stable from 1 224 cents per kilogram in 1997/98 season to 11 260 per kilogram by 2018/2019 season, the price of wool marketed by communal wool producers increased by a substantial share, from 675 cents per kilogram to 7 114 cents per kilogram over the same period.

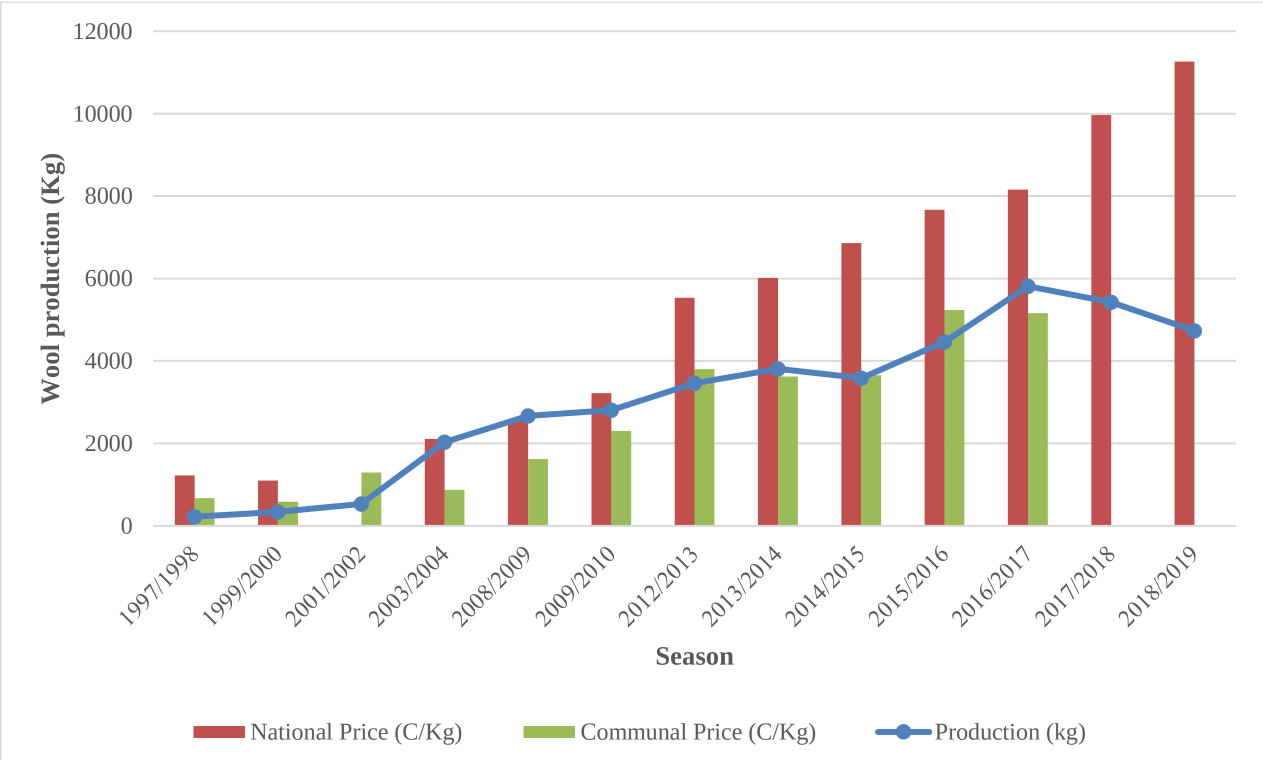

Figure 2.4: Longitudinal trend of wool marketed by communal woolgrowers: 1997-2019
Source: NWGA (2020)

Jordaan (2011), showed that interventions to commercialise wool production in the former homelands had empowered communal woolgrowers to supply between 10% to 12% of South Africa's total wool production, culminating in a fiftyfold increase in wool revenue.

Similarly, De Beer (2012) noted that one of the most notable spill-over effects of the intervention was the increase in the percentage of internal income derived from mutton sales, which evolved from 47% in 2004 to 59% in 2006, and 65% in 2009. This had a substantial impact on the socioeconomic dynamics of the former homelands.

As De Beer (2012) showed, socioeconomic surveys conducted after the implementation of the intervention revealed that the number of children going to bed hungry had fallen from 43.1% to 27.3% while the proportion of households with savings accounts increased from 56.9% to 77.3% and lastly, the number of households borrowing money for school fees declined from 78.4% to 52.3%.

The two communal areas selected for this study, Allen Waters and Ensaam, are beneficiaries of the NWGA intervention and present a case study of whether socioeconomic demographics have substantial statistical significance on wool production, wool productivity per sheep, as well as herd size.

2.5 General characteristics of Study Area A: Allen Waters

2.5.1 Climate and geography

The average annual precipitation is 551 millimetres, while on average, precipitation days are 85.2 per annum. The relative humidity is 61%. Average minimum temperatures range from -7.5° Celsius to 9.2° Celsius. Similarly, average high temperatures range from 24.2° Celsius to 40.6° Celsius.

The village of Allen Waters is situated in a high-lying hill, buffered by mountains in the north and east. The communal grazing area is perennial dryland pastures.

2.5.2 Infrastructure

The roads around the town of Whittlesea are tarred but marred by potholes and debilitating structure. The main road to the village of Allen Waters is gravel and restricts movement after heavy rainfall.

There is one shearing shed at Allen Waters constructed in 1998 as part of NWGA's LandCare program. It is accessible to all the sheep farmers in the village. Prior to 1998, there was a shearing shed constructed in the early 1970's. It was demolished after the construction of the NWGA-commissioned woolshed to make room for a new primary school.

The communal grazing land in the area is fenced and divided into rotational camps to prevent inbreeding and land degradation. The grazing camps are strategically situated next to built-in vertical streams to provide convenient water access for the animals. The community takes collective responsibility for the maintenance of the grazing field as well as the costs associated with it. There is also one communal tank accessible on dipping days. All these facilities were financed by the Department of Rural Development and Agrarian Reform.

There are communal water taps strategically located in central locations within the village. Due to the sporadic water supply by the local municipality, most households have water tanks on their premises. There is a water well adjacent to the communal ploughing fields, which acts as an alternative source of water supply.

In terms of information and communications technology (ICT) infrastructure, the majority of respondents interviewed for this study own cell phones. Although many have no concept of the internet and no access to computers, they own radio and television, to access vital information.

2.5.3 Services offered

Services rendered at Allen Waters range from government-commissioned to private sector-sponsored services. Governmental services offered in the location include a primary school and a free community clinic.

In addition, state welfare grants are delivered directly to beneficiaries at the community assembly area on the third day of every month. The National Woolgrowers Association has an appointed extension officer in the area whose responsibilities include disseminating information relating to genetic improvement, proper shearing, classing techniques, as well as effective veterinary medicine. During this study, the extension officer was in the process of initiating a breeding ram program to enhance the genetic pool of flocks in the area further. The extension officer also acts as a direct link between communal wool growers and BKB (Pty) LTD, the primary marketing outlet for wool produced at Allen Waters.

The local Department of Agriculture, Forestry, and Fisheries administers extension services in the area in the form of dipping sessions as well as conducting educational meetings that inform woolgrowers about a range of technical issues, from crop and livestock disease prevention to current market demands.

2.5.4 Governance

Primary governance at Allen Waters, as is the case in many rural areas across South Africa, is the prerogative of the traditional leader or chieftaincy. The chief of Allen Waters is the supreme authority in the area, whose defining role is land allocation. The sub-district of Hewu, to which villages surrounding Whittlesea fall, is divided into wards. Each ward is under the jurisdiction of a democratically appointed ward councillor tasked with ensuring effective service delivery to the area. Whittlesea falls under Ward 21.

2.5.5 Socioeconomic activities

The community has a *stokvel* or grocery scheme where members purchase groceries for each other at cyclical intervals. Members contribute a mutually agreed-upon fee toward the scheme each month. The grocery scheme has become a vital livelihood strategy for financially embattled families who struggle to purchase food items.

The youth in the area are engaged in skilled occupations such as brick manufacturing, masonry and sheep shearing. Sports such as rugby and soccer, as well as religious fraternities, are the main recreational activities in the area.

2.6 General characteristics of Study Area B: Ensaam

2.6.1 Climate and geography

The prevailing climate at Ensaam is similar to that of Allen Waters as both villages lie in the same region, although Ensaam falls under Queenstown. Similar to Allen Waters, the average annual precipitation is 551 millimetres, while on average, precipitation days are 85.2 days per annum. The relative humidity is 61 %. Average minimum temperatures range from -7.5° Celsius to 9.2° Celsius. Similarly, average high temperatures range from 24.2° Celsius to 40.6° Celsius.

The Ensaam village exhibits quintessential features that characterise the sub-district of Hewu, which means '*flat land'* in IsiXhosa. The village lies on a flat strip of dry land, distant from rivers and other water sources. Water scarcity is critical in the area.

2.6.2 Infrastructure

The main road leading to the Ensaam exit from Queenstown is tarred. However, during this study, the main road to Ensaam village was under construction. The village roads are predominantly gravel.

Ensaam is divided into half by the main gravel road that leads to the village. There is housing on either side of the gravel road, but the electricity supply is only available on the Eastern side of the village, while the western side is without electricity supply as it is populated by newly built houses. There is one shearing shed at Ensaam equipped with tap water, a water tank, and dipping facility.

Development of the shearing shed is still in progress as the outer walls have not been plastered with cement and there is no fencing on the premises. This is because the shearing shed and accompanying infrastructure were constructed by the villagers, independent of external assistance.

Similar to Allen Waters, Ensaam has segregated grazing lands with rotational camps to prevent genetic contamination as well as soil erosion. The camps were constructed by the Department of Rural Development and Agrarian Reform.

Television, radio, as well as the Department of Agriculture, Forestry, and Fisheries educational brochures are the main sources of information in the area. A majority of respondents possessed cell phones, which suggests ICT infrastructure is well developed in the area.

2.6.3 Services offered

As with Allen Waters, services offered at Ensaam are an amalgamation of government-commissioned and private sector-sponsored services. The village has two pre-schools, one of which was constructed by the villagers after the government failed to provide one. There is also a primary school that operates on a zero-fee basis. A mobile clinic visits the village twice a month to provide essential services. The nearest health facility is five kilometres away at a neighbouring village.

The Whittlesea and Queenstown Department of Agriculture, Forestry, and Fisheries, in collaboration with the National Woolgrowers Association routinely conduct advisory services in the area, focussing on livestock genetic improvement, veld management and animal nutrition, among others. Furthermore, a mobile veterinarian routinely visits the village every season to inoculate sheep at the cost of R3 per sheep. The official also trades veterinary supplies to the villagers at discounted prices.

In the winter season, BKB (Pty) LTD provides the shed with feeding bales to supplement feed shortages.

2.6.4 Governance

The statute of primary governance at Ensaam is the prerogative of the Chief, who rules over the land and its allocation to members of the community. Ensaam is also under the governance of a democratically elected ward councillor who is both a member of the community and representative in the town council.

2.6.5 Socioeconomic activities

Sheep farming is the main occupational activity in the area as the population of Ensaam overwhelmingly comprises pensioners who keep sheep as a form of retirement investment. Religious fraternities are also prevalent in recreational activities in the area. There is also a health club for the elderly, where members meet three times a week to perform physical exercises and exchange healthy living ideas.

2.7 Allen Waters and Ensaam Shearing Shed Associations

2.7.1 Background

According to anecdotal accounts provided by elderly respondents, the first shearing shed in Allen Waters was constructed in the early 1970's by the locals with the materials, including fencing and dipping tanks sponsored by the local government. However, the shed was later demolished to make way for a primary school.

The current Allen Waters shearing shed was constructed in 1998 as part of the LandCare Project commissioned by the Department of Agriculture, Forestry and Fisheries in collaboration with NWGA and the Agricultural Research Council. Allen Waters was one of the various villages across the former independent states of Ciskei and Transkei chosen by the National Woolgrowers Association for its potential for commercialised wool production. In 2016, the Allen Waters shearing shed was granted the award for Communal Shearing Shed of the Year, for having recorded no bin lots in its output, which indicated that the woolshed's total output was within market specifications.

The story is different for the Ensaam village shearing shed, which was first established in the late 1960s when members of the association would shear wool at the chairman's private residence. This practise continued until 1999 when, through the NWGA intervention initiative, the association changed its marketing outlet to BKB (Pty) LTD. Although the shearing shed association marketed its output through BKB (Pty) LTD, it was still without a formal shearing shed.

The shed chairman's private residence continued to serve as the association's primary shearing facility until the mid-1980's when internal differences resulted in the disbanding of the association into two opposing factions. The breakaway faction formed the current Ensaam Shearing Shed Association and chose as its headquarters a dilapidated shearing shed that had previously served as a private commercial farm. The new association rebuilt the abandoned shed independently of both government and private sector assistance, and by 2004 the initial round of construction was completed. The association made provisions for water by digging a borehole connected to a running water tap on the shed premises. A separate building fully fitted with a water tank served as the shed's kitchen. Twelve years after completion of the shearing shed, the Department of Agriculture, Forestry and Fisheries sponsored the construction of a dipping tank. The two factions of Ensaam Shearing Shed merged in 2009, when it was unanimously agreed that all woolgrowers in the community would market their output as a collective under the newly constructed Ensaam shearing shed.

Table 2.1: Characteristics of the Allen Waters and Ensaam Shearing Shed Associations

	2013		**2017**	
	Ensaam	**Allen Waters**	**Ensaam**	**Allen Waters**
Male woolgrowers	30	30	30	28
Female woolgrowers	28	35	30	35
Age (avg)	60	61	64	66
Herd size (avg)	37	54	42	63

Source: Calculations using data collected from Allen Waters and Ensaam (2018)

Table 2.1 illustrates the general characteristics of Allen Waters and Ensaam shearing sheds from 2013 to 2017. The gender composition remained unchanged in the male category at Ensaam, with 30 male woolgrowers over the period under observation. By contrast, the number of male woolgrowers at shearing shed association decreased by two members from 30 to 28. In comparison, the analysis for gender composition among females shows the reverse is true.

As illustrated by Table 2.1, the number of female woolgrowers at the Allen Waters shearing shed remained unchanged in the period under observation with 35 members, while at the Ensaam shearing shed the number of female woolgrowers increased from 28 to 30 members.

As anticipated, the age of members in each woolshed increased, with the most significant increase recorded at Allen Waters, where the mean age was 61 years in 2013 and 66 in 2017. Lastly, the number of sheep per farmer increased at both woolsheds over time. At Allen Waters the mean herd size count went up from 54 heads to 63 heads, while Ensaam's increased from 37 heads to 42 heads.

2.7.2 Membership

Membership to both Allen Waters and Ensaam shearing shed associations is open to all members of the community, provided they have at least five sheep.

The joining fee is capped at R50 per member. The members must adhere to the stipulations of the constitution, which encapsulates the shed's code of conduct, penalties, as well as regulations regarding extra contributions. The money covers expenses such as electricity, machine hire, as well as related miscellaneous costs. As shown in Table 2.2, overall membership has not changed between the two time periods.

Table 2.2: General characteristics of Allen Waters and Ensaam shearing sheds

Year	**2013**		**2017**	
Woolshed	**Ensaam**	**Allen Waters**	**Ensaam**	**Allen Waters**
Shearing length (weeks)	2	2	2	2
Average number of sheep shorn per farmer	33.55	54.26	42.75	62.73
Total gross revenue per woolshed (Rands)	249 114	501 098	462 696	1 182 981
Average wool production per farmer (Kg)	4 243	7 669	6 108	10 375
Productivity per sheep (kg/sheep)	2.1	2.1	2.4	2.4
Shearer's earnings per sheep (Rands)			6.0	6.0
Shearer's earnings per ram (Rands)			13.0	13.0
Average wool price (Rands per kg)	56.7	68.6	73.8	113.3

Source: Calculations using data collected from Allen Waters and Ensaam (2018)

As illustrated in Table 2.2, there was an increase in total wool revenue of R249 114 in 2013 to R462 696 by the end of 2017 at the Ensaam woolshed, while at Allen Waters, total wool revenue increased from R501 098 in 2013 to R1 182 981 by 2017. This observed increase is likely the result of improvements in the quality and volume of output as well as prices received by farmers over time. For example, average wool production per farmer increased from 4 243 kilograms and 7 669 kilograms in 2013 to 6 108 kilograms and 10 375 kilograms in 2017 at Ensaam and Allen Waters respectively. Table 2.1 and Table 2.2 show that herd size and productivity per sheep increased across both woolsheds over the period under observation. Therefore, the increases in average wool production per farmer are correlated to changes in these variables. The validity of this hypothesis is further explored in Chapter 5.

2.7.3 Shearing

Shearing occurs once per year between September and October at both Allen Waters and Ensaam shearing sheds. The shearing takes two weeks at both areas. It is done at the communal shearing facility under strict shearing hygiene, classing, weighting, and pressing procedures. The Ensaam shearing shed employs a team of experienced shearers, most of whom are locals raised in wool-producing households. Allen Waters hires experienced contract shearers who are usually unemployed youth residents of the village, or, mobile shearers. Both areas pay shearers R6 per sheep and R13 per ram as shown in Table 2.2. Unlike at Allen Waters, the wool shearers at the Ensaam shearing shed have a separate association, complete with its constitution and rules of conduct.

They have a supervising shearer, an older gentleman, who ensures the correct shearing guidelines are followed and that every shearer is compensated. The team of shearers are highly skilled, and they regularly participate in shearing competitions across the country.

2.7.4 Classing

After shearing, the shearers place the wool fleece onto a classing table, where a contracted professional wool classer separates the various wool types – BKS, AF, LOX, etc. – into their respective categories by National Woolgrowers Association classing standards. The classed wool is transported into a separate table for sorting.

Sorting is done by a team of older women who segregate the wool within its categories, for example, LOX into LOX 1, LOX 2, LOX 3. After the wool is sorted into separate groupings, it is deposited into marked bales for weighing. The team of sorting women, as well as the professional classer, are paid R3 per fleece. The Department of Rural Development and Land Reform, National Woolgrowers Association, and BKB (Pty) LTD collectively conduct regular training sessions on efficient shearing and classing standards. Training sessions are held at the communal shearing shed by extension officers from each institution. Market information and demand is also passed on at the sessions.

2.7.5 Weighing

A special weighing apparatus is used to weigh the different bales of each type of wool. The weight of each bale is recorded into the shed's workbook by the council secretary. Owners of the bales are present during weighing to verify that the record of measurements is accurate.

After weighing, the wool is placed into the hydraulic wool pressing machine for compression into bales of the specified size and weight in preparation for shipment to the BKB (Pty) LTD warehouse in Queenstown.

2.7.6 Marketing

The Allen Waters and Ensaam shearing sheds market their output through BKB (Pty) LTD. The weighted wool bales are transported from the shed premises to BKB warehouses in Queenstown, where they are stored before transportation to the auction site in Nelson Mandela Bay. Transportation costs are deducted from the shed's total proceeds after the auction. There are weekly auctions for wool at the auction site, where a combination of quality, length, and current global prices all determine the final price received by producers. As illustrated by Table 2.3, prices per output received by woolgrowers at the Allen Waters and Ensaam woolsheds have increased between 2013 and 2017.

Average prices received by woolgrowers at Allen Waters increased from R68.6/kg in 2013 to R113.3/kg by 2017. Similarly, the average price received per output by Ensaam's woolgrowers had increased from R56.7/kg in 2013 to R73.8/kg by 2017.

2.8 Factors constraining wool production at Allen Waters and Ensaam

The factors that confront woolgrowers and restrict optimum wool production in these areas are a construct of various issues identified as the main limiting factors of wool production in communal areas of the Eastern Cape by scholars (D'haese *et al*., 2003; Jordaan, 2011; De Beer & Terblanche, 2015). Despite the attempts to resolve these issues, there are persistent challenges that hinder efficient wool production in the areas. Lack of water infrastructure, livestock fatalities, insecure land ownership, lack of credit facilities, poor infrastructure, rising input costs as well as wool and stock theft are all recurring issues.

2.8.1 Water scarcity

According The most persistent and recurring issue that is the most limiting factor to optimum wool production in the two areas is the scarcity of water sources and lack of functioning water infrastructure. The greater Hewu district is relatively drier than surrounding areas with no nearby water streams. Therefore, boreholes and natural wells are the only sources of water. Although there exist water reservoirs on the grazing fields, the recent drought has undermined the community's efforts to store and distribute water efficiently. All households interviewed as part of this study reported that they do not have running water and are entirely reliant on either water tanks or communal water taps. In Allen Waters, the scarcity of water is the leading cause of stock fatalities next to natural predators such as jackals.

2.8.2 Lack of credit access

Due to insecure land tenure rights, woolgrowers find it difficult to access credit as they do not have tangible collateral to put up for loans. The absence of credit facilities exacerbates the issue. Often, woolgrowers resort to reducing expenditure on household essentials, such as food, to purchase feed and veterinary supplies, exposing themselves to poverty risk. Also, lack of credit facilities increases the vulnerability of woolgrowers to loan sharks and other predatory lenders.

2.8.3 Livestock fatalities

Livestock fatalities, from disease and improper stock management are prevalent, especially in Ensaam. Although the researcher could not obtain a formal database containing precise figures of sheep fatalities and causes over the past year, insights provided by community members suggest that death of livestock is correlated to severe drought and a harsh cold front in the previous year. Dry weather conditions brought with them vectors of diseases which culled many sheep, reducing wool production in the area by a large margin.

2.8.4 Poor Infrastructure

The main road to Allen Waters is gravel, which makes travelling from the village to town costly in comparison to villages with tarred roads. Public transport in the area is scarce as poor roads deflect public taxis from servicing the village. The only mode of public transportation for carrying residents and bales is one public bus that departs and arrives once a day, at specified time intervals.

2.8.5 Wool quality

Wool contamination is a leading factor responsible for the high number of bin lots reserved for below standard quality wool at Ensaam shearing shed. Primary contaminants include vegetable matter, paint markings, and waste material such as urine. Detection of this material at the auction site has resulted in woolgrowers realising a lower price for their produce.

2.8.6 Rising input costs

Rising transportation and input costs compel many households to reduce their sheep stock and opt-out of sheep production into non-farming activities, such as masonry and domestic work.

The increase in the price of fuel, feed, veterinary supplies, and more recently, the increase in value-added tax (VAT) has forced many households to shift resources from wool production towards sustenance activities. This has harmed the volume of wool output in the area.

Over the past year alone, the price of a bale of the sheep feed Lucerne has increased by 20% from R60 to R80 per bale making it more costly for farmers, while the cost of breeding rams has increased from R4000 to R4500 over the same period. This has threatened the nutrition of the stock and the aggregate genetic pool, which through the reintroduction of breeding rams, has remained largely of the high-quality Merino breed type.

2.8.7 Wool and stock theft

At Ensaam, woolgrowers have reported a surge in burglaries, with theft of wool bales valued at thousands of Rands. Discouraged woolgrowers have abandoned sheep and wool production altogether because of wool theft. On the other hand, livestock theft is a challenge at Allen Waters. The grazing veld at Allen Waters is fenced and divided into camps. The topography of the grazing veld is hills and a field of shrubs. These shrubs serve as hiding spots for livestock criminals. Sheep are often left to graze overnight, and this exposes their vulnerability to criminals. A third of households that participated in this study reported losing livestock to an organised crime syndicate that targets communities with high-quality sheep. In addition, jackals lurking in the expansive grazing field reduce sheep numbers, specifically lambs, in the area.

2.8.8 Insecure land tenure

The village of Ensaam is situated on customary land under tribal authority. Residents of the area do not have title deeds, thus have no legal claim to the land, which is governed by the traditional council, led by the chief, on behalf of the King. An overwhelming majority of respondents interviewed desire to be granted title deeds over their ancestral land. Since they do not possess legal ownership of the land, they have no collateral and cannot access loans to finance production-related activities.

Similarly, Allen Waters is under the jurisdiction of a traditional leader or *induna* in the local language. This is customary land, an extension of Permission to Occupy land tenure right. Therefore, the residents of Allen Waters do not have formal rights or title deeds to the land they occupy, as by law such rights are the reserve of the traditional council. Likewise, at Ensaam village, the insecurity of land rights in Allen Water limits the prospects of woolgrowers in the area to access credit to purchase inputs and cover miscellaneous costs.

2.9 Conclusion

This chapter has provided a broad overview of the various dynamics upon which wool production in communal areas is predicated. As a prologue, the chapter provided a detailed account of the history of wool production in communal areas of the Eastern Cape as well as the various technical and institutional factors inhibiting optimal wool production in these areas. Subsequently, a detailed account of the general characteristics of the two areas chosen for the study, Allen Waters and Ensaam, was provided.

From this overview, we learned that out of the 63 members who comprise the Allen Waters woolshed, there are 35 female woolgrowers and 28 males. The dominance of women at the Allen Waters woolshed is also reflected in the association's leadership, which is one of the few in the region to have a female chairperson.

In contrast, the study showed that the Ensaam woolshed association has a 50% gender-balanced membership with 30 male and 30 female woolgrowers. The average age of woolgrowers at the Allen Waters woolshed is 66 years, while the average flock size is 63 heads of sheep. Similarly, the average age of woolgrowers at Ensaam is 64, while the average flock size is 43.

The chapter also dichotomized the characteristics of each woolshed to describe the average number of sheep shorn annually, average wool production per sheep, average wool price received per kilogram, as well as the total gross revenue per woolshed. A notable discovery from this assessment is the growth in the variables of interest from 2013 to 2017. Briefly, average wool production at Ensaam increased from 4 243 kilograms per farmer in 2013 to 6 108 kilogram per farmer in 2017. Similarly, average wool productivity per sheep in both study areas increased uniformly from 2.1 kilograms of wool per sheep in 2013 to 2.4 kilograms per sheep in 2017. Meanwhile, average price received per kilogram of wool marketed by woolgrowers at Ensaam increased from R56.7 per kilograms sold in 2013 to R73.8 per kilograms sold in 2017. The average price received by woolgrowers at Allen Waters increased from R68.6 per kilograms sold in 2013 to R113.3 per kilograms sold in 2017, which was relatively higher than the national average price per kilogram sold of R55.65 in 2013 and R100,24 in 24 in 2017.

Aggregate wool revenue at Ensaam increased from R249 114 in 2013 to R462 696 in 2017. Meanwhile, aggregate wool revenue for Allen woolshed increased from R501 098 in 2013 to R1 182 981 in 2017. Though there have been financial and operational improvements in the proportion of wool produced at Allen Waters and Ensaam, woolgrowers in these areas are still confronted by technical and institutional constraints.

Water scarcity, rising input costs, lack of credit access poor on/off farm infrastructure, sheep theft, as well as increased livestock fatality caused by the drought are recurring issues. Regardless of these obstacles, woolgrowers of Allen Waters and Ensaam have demonstrated consistent resilience, as reflected in improvements in both shearing sheds over time.

CHAPTER 3: SURVEY DESIGN, DATA AND METHODOLOGY

3.1 Introduction

This chapter outlines the research design, the process for collecting data and the analytical methods adopted. The first section of the chapter defines the study area and outlines the sample selection method that was employed, followed by a description of the questionnaire design. The chapter then outlines the interview process, which involved a pilot study before conducting the main study to test the validity of the data-collecting instruments. The second section provides summary statistics of the results and challenges encountered during the data collection phase. The third and final section discusses the two main methods used for data analysis in the study.

3.2 Survey design

3.2.1 Study area selection

The communities of Allen Waters and Ensaam were selected as primary study areas as they are constituents of the region of the Eastern Cape informally referred to as the “wool belt.” Allen Waters and Ensaam allow for a comprehensive understanding of the factors that determine wool production, wool productivity and herd size among woolgrowers in communal areas. In addition, the two areas were selected as they were in the first group of recipients of the NWGA’s LandCare intervention. The intervention was introduced in 1998 and 1999 at Allen Waters and Ensaam, respectively.

Although the data obtained for this study does not encompass the full duration of the period beginning with the inception of the intervention in 1998/1999. It does, nonetheless, allow us to make plausible inferences about the phenomena of interest by analysing data over a five-year period, from 2013 to 2017.

3.2.2 Sample selection

The study attempts to establish factors that determine increased wool production in communal areas of the Eastern Cape that were beneficiaries of the National Woolgrowers Association’s LandCare intervention. As such, it uses wool-producing households in both study areas as the unit of analysis. The study then purposefully samples households based on the availability of characteristics important for capturing the anticipated research objectives, such as total wool output per household.

The sample selection comprises 65 participants from Allen Waters Shearing Shed Association and 58 participants from Ensaam Shearing Shed Association, totalling 123 participants.

3.2.3 Questionnaire design

The study developed a questionnaire to capture data for the years 2013 and 2017 (recorded in the end year) in order to quantify changes that might have occurred over time. The changes could be attributed to the growth in revenue due to the cumulative effects of the intervention.

Furthermore, the questionnaire measured changes in wool production, household income and improvements, or the lack thereof, in the general living standard of residents in the two study areas. The general themes covered by the questionnaire in different sections are demographics, wool production, household demographics, land tenure and household living standards. Table 3.1 shows the dimensions that guided data collection.

Table 3.1: Key dimensions of the study questionnaire

Wool production	Household demographics	Land tenure	Household living standards
Sheep stock composition	Household roster	Tenure type	Type of dwelling structure
Operational farm expenses	Household income source	Size of arable plot	Asset ownership
Annual net weight of wool clip and classification	Percentage of household income from wool revenue	Structure of grazing land: Communal and free-range	Main household expenditure items
Net wool revenue	Non-farm income activities financed with wool profits	The total size of grazing land	Evolution of household food basket

Source: Author's own compilation (2018)

The study collected both primary and secondary data. The secondary data encompasses historical records of wool produced in kilograms, classification, and financial proceeds received by each woolgrower per woolshed association. The amalgamation of such proceeds is the association's profit after transaction costs have been deducted. Secondary data was obtained from BKB (Pty) LTD which, as previously alluded, is the primary link to the formal marketing channel for woolgrowers in communal areas. At the end of the shearing season, each member of the association receives a copy of an invoice containing the total wool sold at the auction as the well as the financial proceeds from the sale. BKB (Pty) LTD retains the master copy. Thus, the study uses this data to compute wool production per shed.

Primary data collection involved a field experiment with the aid of an open-ended questionnaire conducted in a scheduled, structured interview.

Scheduled interviews allow the researcher to assemble a comprehensive set of characteristics to investigate before the interview process. This involves the provision of alternative questions that allow respondents to formulate their definition of the issue under investigation so that they may accurately express their experiences (Bless, Smith and Sithole, 2013). The two data sets, primary and secondary, were combined for the analysis of the study.

3.2.4 The Interview processes

The interview process for the selected households began with community meetings organised with the help of the NWGA's extension officer. This meeting took place at the village headman’s residence for Allen Waters village, while at Ensaam, the meeting convened at the communal shearing shed. The gathering informed community members in both communities about the purpose of the research. It outlined the roles of both the researcher and respondents in the local language, IsiXhosa. It further informed residents in both communities that the researcher would be visiting their households at specified time intervals to interview them on several subjects ranging from wool production to the evolution of their living standards. The meetings further reminded communities that the research was strictly for academic purposes and not commissioned by the Department of Rural Development and Agrarian Reform. This was necessary to reduce potential biases in responses due to expectations related to government programs amongst the respondents.

The researcher hired two field workers from each village who assisted the researcher in conducting the interviews. The field workers were locals and helped the researcher identify specific households affiliated with the communal shearing shed. The maximum time allowed for completion of each questionnaire was 30 minutes per interview, to allow respondents to adequately answer open-ended questions and express their opinion while providing relevant insights. The survey took three days to complete for the pilot study, and 34 days for the main study.

3.2.5 The pilot study

One scholar defines a pilot study as, “a research study that tests the feasibility of an approach that will later be used in a larger study.” The study tests feasibility without attempting to prove or disprove a theory or research hypothesis (Frey, 2018). Although a pilot study does not necessarily guarantee success in the main study, it increases the likelihood of success (Van Teiljen & Hundley, 2001).

The researcher of this study followed the advice of these authors to conduct a pilot study using face to face structured interviews with respondents at their respective households. The interviewer read aloud open-ended questions, translated from English to IsiXhosa.

The questionnaire encompassed three main themes: household attributes changes, wool production and household living standards. The study further collected data relating to annual wool clip and financial proceeds from the sale of wool. The association did not have comprehensive historical records in its possession, thus a detailed record of wool production and financial proceeds was obtained from BKB (Pty) LTD.

The questionnaires interviewed top-three permanent residents of the household measured by the hierarchy of decision-making and economic contribution to household income. The three individuals provided their income source information, which was aggregated to compute total household income.

3.2.6 The main study

Prior to the main study's interview process, the researcher contacted the chairperson of both Allen Waters and Ensaam shearing sheds to formally book interview sessions with members. This was done to ensure maximum participation. Thereafter, the researcher stratified the study sites into four sub-areas in accordance to the availability of members at the time of the interview.

3.3 Data

3.3.1 Field data recording and cleaning

The data collected for the pilot and main studies was prepared in a codebook. This was done to assign numerical values to answers and insights obtained from the respondents. The researcher coded the data in Microsoft Excel before exporting it to Stata version 15 for 'data cleaning' and rectification of potential errors in recording. Table 3.2 provides summary statistics of the final sample used in the study for both descriptive and empirical analysis. The observations contained in Table 3.2 comprise output of the data post the data sorting process.

Table 3.2: Summary Statistics

Variables	Mean	SD	Min	Max
Age	62.39	10.69	34	88
Household size	4.423	1.908	1	9
Herd size (Number of sheep)	48.91	54.08	4	348
Wool revenue (Log value in Rands)	9,739	13,532	247.7	101,348
Household Income (R)	38,619	33,537	2,217	251,228
No formal education	0.260	0.440	0	1
Primary school	0.309	0.463	0	1
High school	0.325	0.469	0	1
Completed high school	0.0976	0.297	0	1
Tertiary education	0.0081	0.090	0	1
Unemployed woolgrower	0.671	0.471	0	1
Part-time employed woolgrower	0.130	0.337	0	1
Full-time employed woolgrower	0.199	0.400	0	1
Male woolgrower	0.488	0.501	0	1
Female woolgrower	0.512	0.501	0	1
Married woolgrower (1=yes;2=no)	0.553	0.498	0	1
Remittances (1=yes; 2=no)	0.488	0.501	0	1
Social grants (1=yes; 2=no)	0.313	0.465	0	1
Allen Waters (130 farmers)	0.528	0.500	0	1
Ensaam (116 farmers)	0.472	0.500	0	1
Number of observations	246			

Source: Data sampling used in the study (2018).

In the sample, we note that the average household income is R38 000, of which R10 000 is derived from the sale of wool output. The average age of respondents is 62 years, while the average family has 4 members. The respondents have an average herd of 48 sheep per household.

When we observe the level of education, 26% of the sample do not possess formal education, 31% obtained a primary education, and a total of 33% enrolled for secondary education, meanwhile a total of 10% of the respondents completed high school, and lastly, 0.8% possess tertiary qualifications. Since the study used the same sample from 2013 to 2017, it has zero attrition rate at household level.

In the sample, 67% of the respondents are unemployed, 13% are part-time employed, while 20% are fully employed in the off-farm labour and service markets. This may imply that the largest percentage of respondents are involved in wool production on a full-time basis since they are not engaged in the off-farm labour market.

The sample consists of a gender ratio of 51% women and 49% men. Analysis of the respondents' marital status reveals that 5% of the respondents are divorced, 55% married, 18% single and 22% widowed.

Across the two woolsheds, Allen Waters encompasses 53% of respondents in the sample while Ensaam comprises the remaining 47%. In terms of alternative income transfers, 49% of the respondents receive remittances while 51% do not. In addition, a total of 31% of respondents receive social grants while a total 68% of the respondents do not.

3.3.2. Constraints to field data collection

The villages of Ensaam and Allen Waters, as with many rural areas of the Eastern Cape, are characterized by poor infrastructural development. The roads are gravel and in abysmal condition, which greatly limited the researcher's movement.

Although a considerable share of individuals surveyed as part of the study had a background in primary education, many were illiterate and did not understand certain terms in English. In addition, they didn't have in their possession a historical record of wool production trends and income. Thus, the researcher had to translate to the local language and help respondents calculate their operational expenses, as well as total household income.

3.4 Methodology

3.4.1 Analytical strategy

The paper uses two types of descriptive statistics to uncover determinants of changes in wool production, productivity and herd size in communal areas of the Eastern Cape. The first type of descriptive statistics used are bar graphs. The bar graphs convey qualitative information that illustrates how variables of interest have evolved as well as differences in the scale of the evolution across sheds and sociodemographic characteristics.

The second type are descriptive tables which compare the outcomes of interest using two tailed t-tests to establish the statistical significance of the observed differences. The t-test are categorically presented at 1-5% and 10% levels of significance. The t-tests have been applied to test the significance of differences across the two wool sheds and the sociodemographic characteristics of their members.

As results from the above-mentioned methods compliments each other, the study discusses them in tandem. Thus, through results yielded by these two methods, the study unpacks the main objectives of the paper over two chapters

3.4.2 Overall analysis and comparison by wool shed

The first chapter of the analysis in the study (Chapter 4) compares changes in wool production, wool productivity and herd size over time, for the entire sample, using both graphs and statistical tables which are evaluated using t-tests. This step is necessary to establish whether there are observable differences in outcomes prior to conducting a detailed analysis.

In order to establish the extent of differences between the two woolsheds, a difference in difference between them is calculated over the five-year period under observation. Data outcomes of each respective woolshed between 2013 and 2017 are subtracted, thereafter the difference between the two differences is calculated for both woolsheds. This permits us to observe whether changes in the evolution of wool dynamics in the general sample is due to inherent differences between the woolsheds. In addition, this provides a guideline of whether the detailed analysis should be segregated by woolshed or conglomerated into one full sample.

3.4.3 Analysis by socio-demographic characteristics and possible transmission mechanisms

The second chapter of the analysis (Chapter 5) is presentation of descriptive statistics and t-tests the to establish the factors that determine the evolution of wool production at Allen Waters and Ensaam woolsheds. The analysis begins by examining how wool production, wool productivity and herd size have changed between the years 2013 and 2017 across socio-demographic characteristics. The social demographic characteristics included in the study are as follows:

- *Gende*r: The gender of a wool grower has a significant impact on the outcome of their operations due to differences in gender roles between males and females, which may affect the volume of wool they produce. For example, unlike their male counterparts, female woolgrowers' time tends to be divided between household responsibilities and sheep farming.

- *Marital status*: The inclusion of the marital status variable in the analysis permits us to establish the validity of two related hypotheses. The first being that married woolgrowers divide labour and operational costs of sheep farming between them, which may lead to higher productivity levels per sheep shorn than single woolgrowers. Conversely, the second hypothesis purports that married woolgrowers devote less time to sheep farming due to increased household responsibilities such as child rearing. Thus, the study includes marital status in its analysis to establish the influence of this variable to wool production outcomes.
- *Employment*: The hypothesis as it relates to employment status is that individuals who are fully employed are likely to devote less time to sheep farming than those who are unemployed. The alternative hypothesis is that fully employed individuals may invest their income from the off-farm labour market to their wool operations, leading to improved outcomes.
- *Education*: Similarly, woolgrowers in possession of higher education qualifications are likely to allocate less time to wool production operations due to pre-occupation with off-farm employment. A parallel hypothesis is that individuals who possess higher education qualifications are likely to produce higher levels of wool volumes and wool productivity per sheep relative to their peers without formal education qualifications.
- *Age*: Older people may have accumulated more assets and income over time that can be used as supplementary investments in wool growing.
- *Remittances and social grants*: The inclusion of this variable in the analysis allows for the evaluation of the hypothesis that income transfers are used, among other functions, to finance wool production operations. Alternatively, the inclusion of this variable allows the evaluation

of the claim that beneficiaries of income transfers are less likely to rely on wool production as a source of livelihood. As there may be intrinsic disparities between individuals who are beneficiaries of income transfers and those who are not, the inclusion of this variable, therefore, permits the evaluation of differences between these two groups and as well as the observation of how these differences influence the scale of productivity, respectively.

3.5 Conclusion

This chapter presented the research design adopted in the study, the data collected, and methodology used for data analysis. The design defines the study area and outlines the sample selection method that was employed, followed by a description of the questionnaire design. This section also outlines the justification of the study area. It further shows an outline of the interview process, which involved a pilot study before conducting the main study, to test the validity of the data-collecting instruments.

The second section provides summary statistics of the resultant ‘clean’ data and outlines the challenges that were faced during the data collection phase. The third and final section discusses the methods followed by the data analysis of the study.

CHAPTER 4: AN ANALYSIS OF PROGRESSIONS IN WOOL PRODUCTION, WOOL PRODUCTIVITY PER SHEEP AND HERD SIZE

4.1 Introduction

This chapter presents the overall trends that characterise the progression of wool production per woolgrower, wool productivity per sheep and herd size per woolgrower at the Allen Waters and Ensaam woolsheds following the NWGA's LandCare intervention. Changes in wool production, wool productivity per sheep and herd size over the five-year period beginning in 2013 and ending in 2017 are analysed using paired t-tests. In addition to an aggregate analysis, the chapter also analyses changes in these variables for each woolshed individually over this period. As alluded to in Chapter 3, the data used in the analysis for this section of the study is of both primary and secondary variety.

The hallmark findings of the internal analysis of both woolsheds reveal significant changes in wool production and wool productivity, but no significant changes in herd size during the period under observation. When the analysis is conducted to observe the statistical significance of observed differences between the two woolsheds, however, there appears to be no evidence of significant differences in average wool production, wool productivity per sheep, herd size.

4.2 Average total wool production per woolgrower, wool productivity per sheep and herd size per woolgrower, 2013-2017

This section outlines the observed total average wool production, productivity per sheep and herd size at the Allen Waters and Ensaam woolsheds between 2013 and 2017. Establishing the nature of the progression characterising these variables for both woolsheds is essential for establishing the extent to which such changes may be attributed to NWGA's LandCare intervention. Similarly, observing the evolution of these variables for each woolshed individually permits the analytical measurement of differences, and intrinsic indicators of causality, in average total wool production per woolgrower, wool productivity per sheep and herd size per woolgrower.

Figure 4.1 illustrates the average total wool production per woolgrower, while Figure 4.2 illustrates average total wool productivity per sheep, and Figure 4.3 illustrates the average total herd size per woolgrower for Allen Waters and Ensaam woolsheds collectively between 2013 to 2017. From the results, we note that average total wool production per woolgrower, average wool productivity per sheep, and average total herd size per woolgrower increased respectively over the duration of the period under observation. As illustrated by Figure 4.1, Average total wool production per woolgrower increased from 96.85 kilograms to 134.01 kilograms, representing a 38.37% increase in yield.

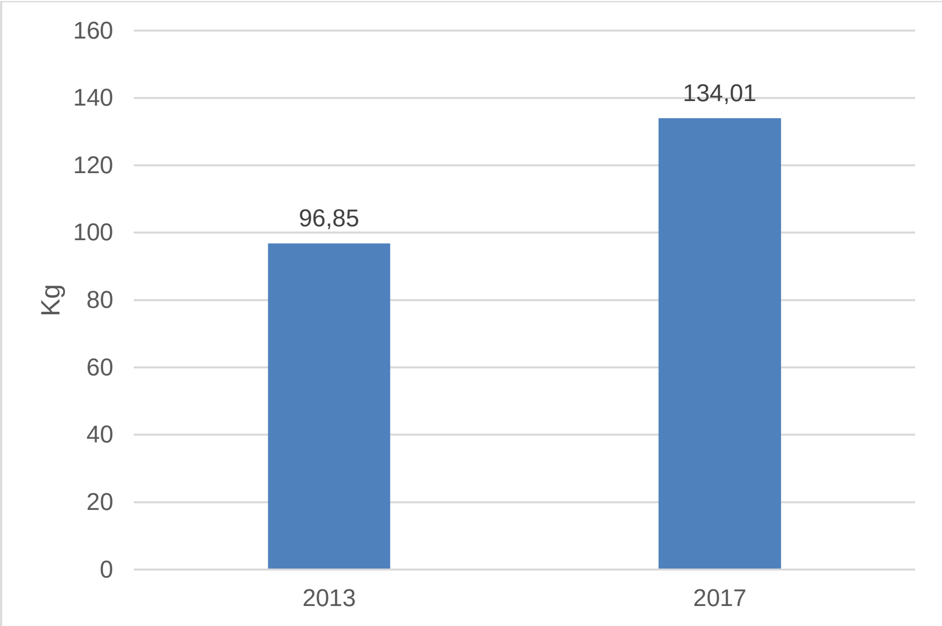

Figure 4.1. Average total wool production per wool woolgrower in Allen Waters and Ensaam, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Average wool productivity per sheep increased from an average of 2.14 kilograms per sheep to 2.43 kilograms per sheep, representing a 13.52% increase in the average quantity of wool productivity per sheep, as illustrated by Figure 4.2.

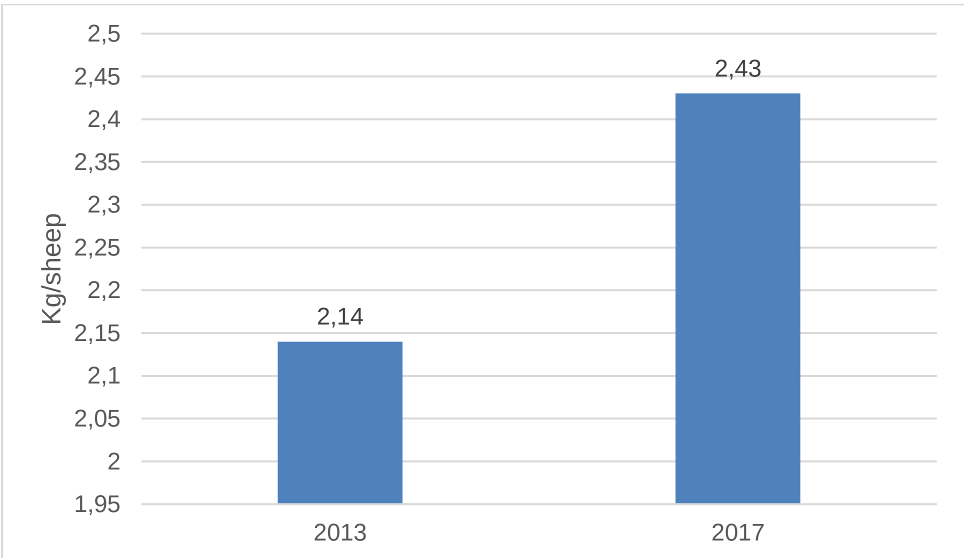

Figure 4.2. Increase in average wool productivity per sheep in Allen Waters and Ensaam, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Figure 4.3 illustrates that average total herd size also increased from an average of 45 sheep per woolgrower to 53 sheep per woolgrower, representing a 19.82% increase in herd size.

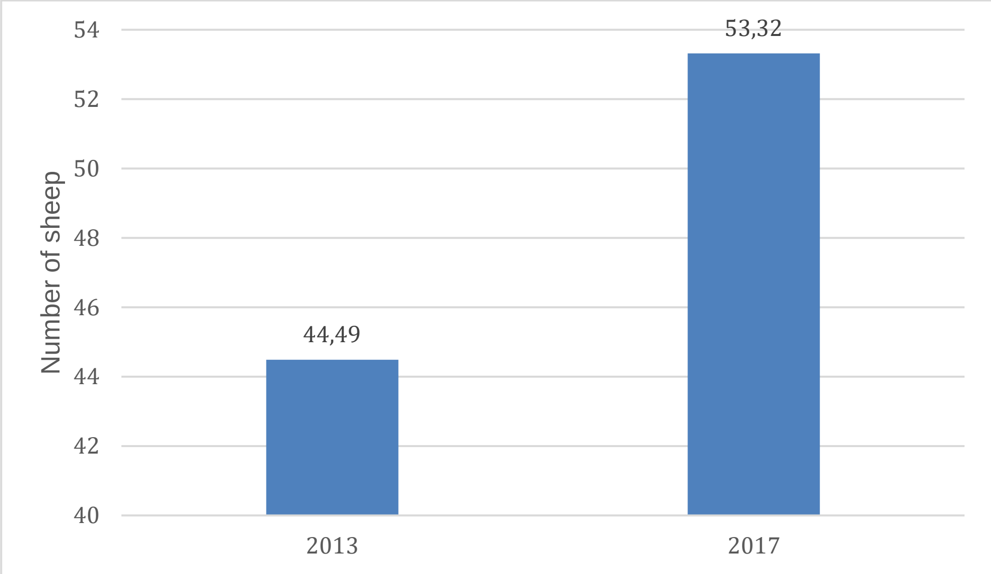

Figure 4.3. Average total herd size per woolgrower in Allen Waters and Ensaam, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

From the results, it is noted that observed increases in average wool productivity per sheep and average herd size per woolgrower coincide with an upward trend in average total wool production per woolgrower. It is important to note that that these variables are, for the most part, mutually exclusive and that one is not necessarily a function of the other. Their parallel progression, therefore, warrants further investigation of the statistical significance of observed changes observed in each of them. Thus, Table 4.1 provides results of a paired t-test to establish the statistical significance of increases in average total wool production, increase in average wool productivity per sheep and total herd size per woolgrower over the period under observation.

Table 4.1: Paired t-tests of average total wool production per woolgrower, wool productivity per sheep and average herd size per woolgrower, 2013-2017

Year	**2013**		**2017**		**Difference**
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Average wool production per woolgrower	96.848	112.560	134.011	149.917	-37.163*
Average wool productivity per sheep	2.145	0.103	2.435	0.207	-0.290***
Average herd size per woolgrower	44.496	50.460	53.317	57.345	-8.821
Observations	123		123		246

*** p<0.01, ** p<0.05, * p<0.1

From Table 4.1 we note that the increase in average total wool production per woolgrower, wool productivity per sheep and average total herd size per woolgrower are statistically significant over the period under observation. This implies that the mean difference of 38.7% in average total wool production is statistically significant. Likewise, the increase of 13.52% in average wool productivity per sheep between 2013 to 2017 is statistically significant. Despite average total wool production per woolgrower increasing by a larger percentage share than average wool productivity per sheep, the test of significance reveals that the increase in average wool productivity per sheep is more statistically significant (at 1% level of significance) than average total wool production per woolgrower (at 10% level of significance). This finding implies that the increase in average wool productivity per sheep observed in the results occurred over a greater proportion of woolgrowers in the sample relative to similarly observed changes in average total wool production per woolgrower. While the increase in average wool production per woolgrower might be driven by a small number of woolgrowers, the increase in average wool productivity per sheep is likely a result of collective improvements in sheep management techniques over time.

We further note the insignificance of the recorded growth in average total herd size per woolgrower between 2013 and 2017. This finding implies that, though combined average herd size at Allen Waters and Ensaam increased by 19.82% between 2013 and 2017, this increase was not statistically significant, as illustrated in Table 4.1. The increase in average herd size observed in the results is merely a reflection of a minority of woolgrowers in the sample who experienced a surge in sheep numbers while the change experienced by the majority was, from a statistical perspective, largely insignificant.

It is, therefore, plausible to infer that the growth in average wool production per woolgrower recorded in the two study areas is primarily driven by improvements in wool productivity per sheep, and not necessarily growth in herd size per woolgrower, as shall be illustrated by a series of graphical depictions and paired t-test tables contained in this chapter. Nevertheless, it is important to test this claim at a micro level by analysing the dynamics underpinning the observed changes per woolshed over the period under observation.

The following section, therefore, presents findings of such an analysis with a specific focus on changes in average wool production per woolgrower, increase in average wool productivity per sheep, and average herd size per woolgrower between the two woolsheds individually.

4.3 Average increase in wool production per woolgrower, wool productivity per sheep and herd size per woolgrower between Allen Waters and Ensaam woolsheds, 2013-2017

The previous section detailed the combined progression of average total wool production per woolgrower, wool productivity per sheep and average total herd size per woolgrower at Allen Waters and Ensaam woolsheds between 2013 and 2017. This section, therefore, analyses the differences in the extent of observed changes observed in these variables for the two case study areas respectively.

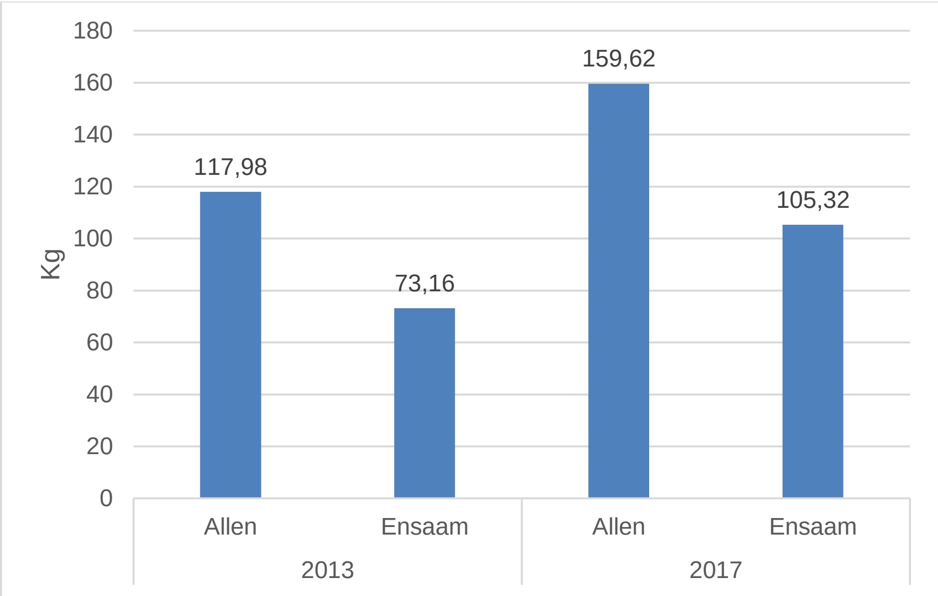

Figure 4.4. Average wool production per woolgrower in Allen Waters and Ensaam, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

From the findings in Figure 4.4, it is noted that the proportion of wool produced at Allen Waters increased from an average of 117.98 kilograms per woolgrower in 2013 to an average of 159.62 kilograms per woolgrower by 2017, while at Ensaam the average increase was from 73.16 kilograms per woolgrower to 105.32 kilograms per woolgrower over a similar period. These findings suggest that, at the aggregate level, the Allen Waters woolshed produced higher average wool production levels per woolgrower than the Ensaam woolshed, despite the Ensaam woolshed experiencing a higher percentage increase (43.96%) in average total wool production per woolgrower than Allen Waters (35.29%).

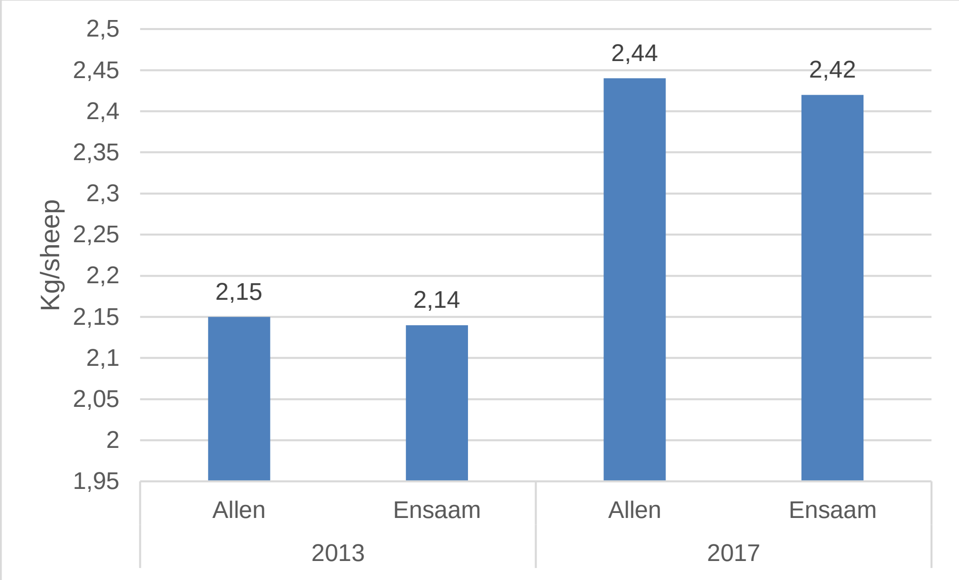

Figure 4.5. Average wool productivity per sheep at Allen Waters and Ensaam, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

When average wool productivity per sheep is analysed at the Allen Waters woolshed, an average increase of 2.15 kilograms per sheep in 2013 to 2.44 kilograms per sheep in 2017 is observed. Meanwhile, average wool productivity per sheep at Ensaam increased from 2.14 kilograms per sheep in 2013 to 2.42 kilograms per sheep in 2017. The percentage change of this increase for Allen Waters and Ensaam woolsheds is 13.49% and 13.08%, respectively.

Similarly, average total herd size at Allen Waters increased from 54 sheep per woolgrower in 2013 to 63 sheep per woolgrower by 2017, while total average herd size in Ensaam increased from 34 sheep per woolgrower to 43 sheep per woolgrower over the similar period. This constituted a percentage increase of 26.47% in average herd size per woolgrower per woolgrower at Ensaam, while for Allen Waters the percentage increase in average herd size per woolgrower was 16.67%. Above all, both woolsheds recorded upward trends across all three variables analysed.

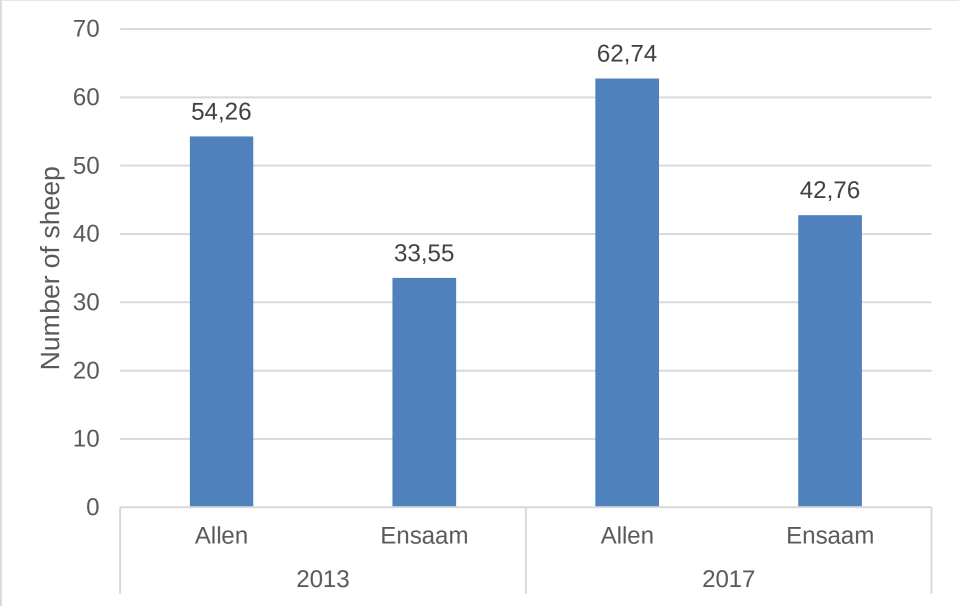

Figure 4.6. Average total herd size per woolgrower in Allen Waters and Ensaam woolsheds, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Notably, however, there was a greater percentage increase of average total wool production per woolgrower as well as average total herd size per woolgrower at Ensaam woolshed relative to Allen Waters woolshed. However, the observed increase in wool productivity per sheep was similar at both woolsheds. On a primary scale, the relatively higher increase in the average herd size per woolgrower at Ensaam woolshed could be one of the factors influencing the higher percentage of average wool production per woolgrower in this area relative to Allen Waters.

Nevertheless, these findings warrant the evaluation of whether the observed increases in mean wool production per woolgrower, average wool productivity per sheep, and average total herd size per woolgrower across the two woolsheds are statistically significant. Thus, Table 4.2 presents results of a paired t-test that describes the statistical significance of changes in the variables of interest per woolshed for the period under review.

Table 4.2: Paired t-test of the statistical significance of differences in average wool production per woolgrower, wool productivity per sheep and herd size per woolgrower in Allen Waters and Ensaam woolsheds, 2013-2017

Shed	Allen Waters		Ensaam		Difference
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Average wool production per woolgrower	41.632	154.045	32.155	50.314	9.477
Average wool productivity per sheep	0.296	0.236	0.283	0.189	0.014
Average herd size per woolgrower	8.477	58.389	9.207	20.824	-0.730
Observations	65		58		123

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

As illustrated by Table 4.2, there is no evidence to suggest that the observed difference in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower is statistically significant when the two woolsheds are compared. This finding suggests that differences in observed percentage changes between the two woolsheds occurred for a minority of woolgrowers, while the changes that were experienced by the majority were not of statistical significance. As such, little insight is to be gained from analysing average total wool production per woolgrower, average wool productivity per sheep and average total herds size per woolgrower for each respective woolshed as the observed changes over the five-year period are similar at the least, and statistically insignificant at the most.

This discovery, therefore, warrants the analysis of the factors that determine wool production in the study areas at a *macro*, in lieu of *micro*, level.

4.4 Conclusion

This chapter has presented the overall changes in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower in two communal areas of the Eastern Cape Province for the period commencing from 2013 to 2017. This period forms part of the time frame during which the LandCare intervention commissioned by the National Wool Growers Association (NWGA) was in procession.

The chapter has made use of both graphical illustrations and two-tailed t-statistical tests to present evidence of an overall increase in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower at the Allen Waters and Ensaam woolsheds between 2013 and 2017.

While the increase in average total wool production per woolgrower and average wool productivity per sheep is statistically significant across both woolsheds, the increase in the average total herd size per woolgrower is statistically insignificant. The lack of statistical significance for the increase in average herd size per woolgrower may be attributed to the change in question occurring over a minority of woolgrowers in the sample, while the change that occurred over the majority was, as previously alluded to, statistically insignificant.

Furthermore, the chapter has analysed changes in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower for each woolshed, independently. To this end, analytical findings contained in the chapter have established that the progression of average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower between the two woolsheds is not statistically different relative to the other. Although there are notable disparities in average wool productivity per sheep, average total herd size per woolgrower as well as recorded quantities of average total wool produced by the two woolsheds, it is important to note that observed changes in these factors is similar when the two woolsheds are compared. As such, the study proceeds in the next chapter to deconstruct these changes across socio-economic characteristics of woolgrowers at the aggregate level.

CHAPTER 5: A DYNAMIC ANALYSIS OF WOOL PRODUCTION, WOOL PRODUCTIVITY AND HERD SIZE

5.1 Introduction

This chapter discusses the dynamics of total wool production per woolgrower, wool productivity per sheep and total herd size per woolgrower across several sociodemographic factors. The primary focus of the chapter is presenting variations in average total wool production, average wool productivity per sheep and average total herd size across woolgrowers' demographic differences. The chapter aims to establish the degree to which socioeconomic characteristics influence the progression of wool production in the two case study areas, Allen Waters and Ensaam woolsheds, from 2013 to 2017.

The demographic characteristics analysed in this chapter include woolgrowers' gender, marital status, education, age, employment status as well as income transfers such as social grants and remittances.

Key findings of the chapter reveal a significant increase in average wool productivity per sheep across all demographic characteristics analysed and no significant increases in the average total herd size per woolgrower. A total of three demographic variables in the sample, namely: male, married female and working-age woolgrowers recorded significant increases in average total wool production per woolgrower over the period under observation. It is further noted that the statistically significant increase in average total wool production among male as well as married female woolgrowers is driven by a combination of average wool productivity per sheep, changes in employment status as well as higher household income.

5.2 Gender of woolgrower

The gender of a wool grower has the potential to affect recorded wool output due to social, economic, and cultural differences that may exist between male and female woolgrowers. In particular, these differences may impact their average wool productivity levels per sheep and average total herd size per woolgrower, as there may be an asymmetry in terms of access to information relating to appropriate sheep management techniques as well as required skills to enhance levels of wool productivity per sheep. Thus, to examine the extent to which gender influences outcomes in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower, this section analyses changes in these variables among woolgrowers of Allen Waters and Ensaam woolsheds over the period under observation.

Figure 5.1 illustrates that the average wool output was substantially higher among male woolgrowers between 2013 and 2017. Mean total wool production for female woolgrowers increased from 87.84 kilograms in 2013 per woolgrower to 105.52 kilograms per woolgrower in 2017, representing a growth figure of 20.13%. Similarly, average total wool production per woolgrower among male woolgrowers grew from 105.42 kilograms per woolgrower in 2013 to 161.15 kilograms per woolgrower in 2017, representing an increase of 52.86%.

In addition to producing higher volumes of wool than their female counterparts in absolute terms, male woolgrowers also recorded a higher percentage increase in output levels than female woolgrowers over the period under observation.

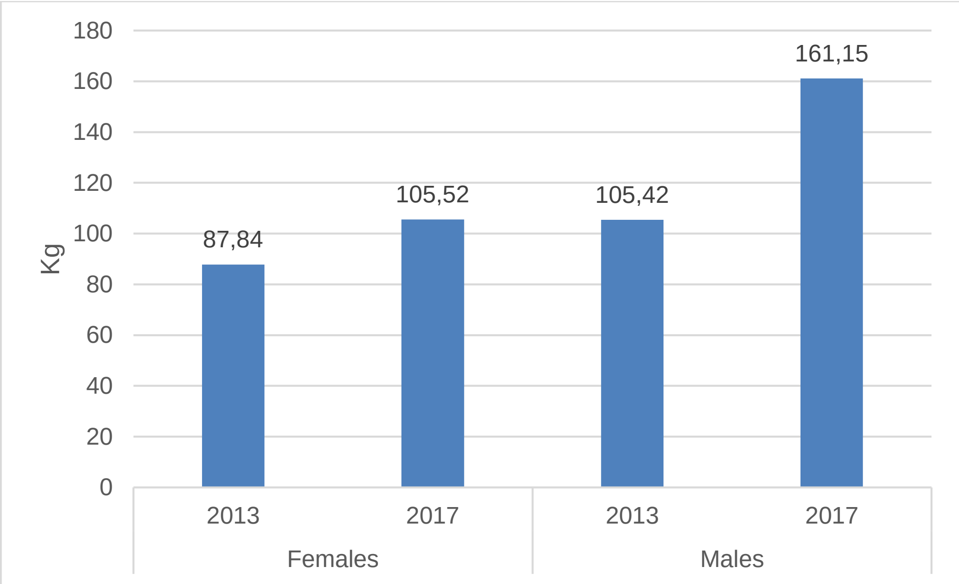

Figure 5.1: Average wool production per woolgrower by gender, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

These results are consistent with an earlier finding that average total wool production is primarily driven by male woolgrowers, who also possess higher levels of average wool productivity per sheep than their female counterparts.

It is further noted from Figure 5.2 that average wool productivity levels per sheep were higher among male woolgrowers, with a percentage increase of 20.13% (2.15 kilograms per sheep in 2013 to 2.49 kilograms per sheep in 2017) than female woolgrowers. Female woolgrowers' average wool productivity per sheep increased from 2.14 kilograms per sheep to 2.38 kilograms per sheep, representing an increase of 11.21% over the period under observation.

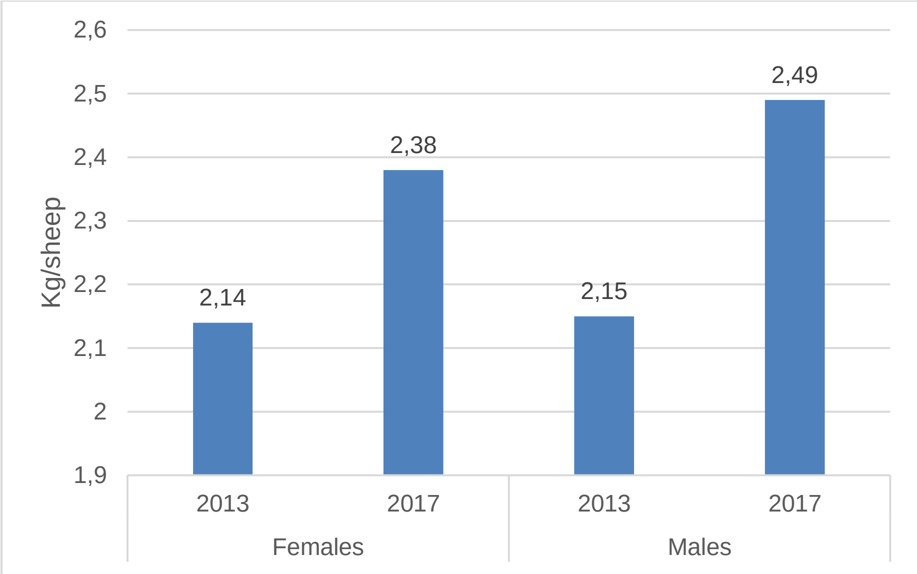

Figure 5.2: Average wool productivity per sheep by gender of woolgrower, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Likewise, it is noted that the average total herd size per woolgrower is also predominantly higher among male woolgrowers than female woolgrowers, as indicated by Figure 5.3.

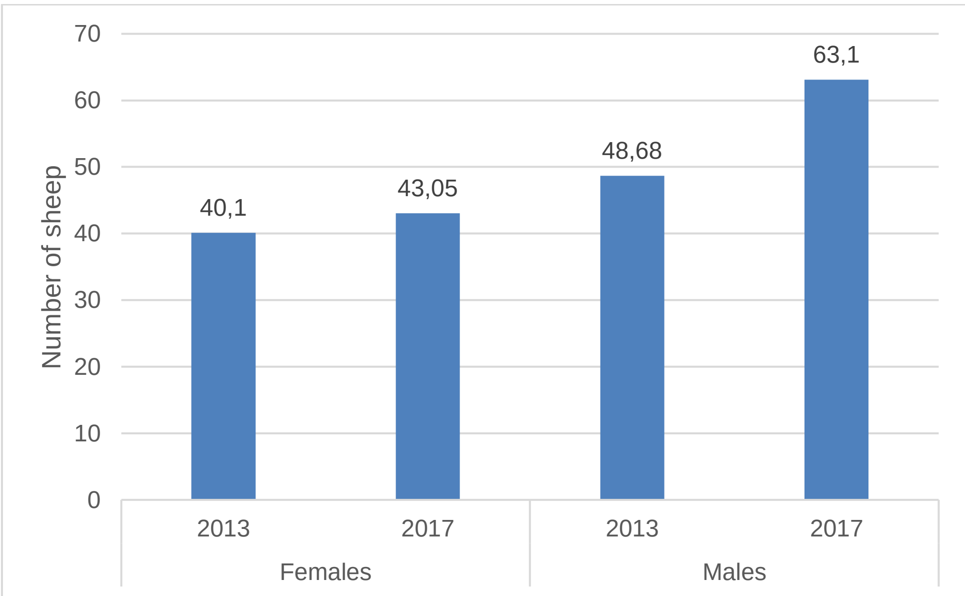

Figure 5.3: Average herd size per woolgrower by gender, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Average total herd size among male woolgrowers increased by 29.62%, while the average total herd size among female woolgrowers increased by 7.36%.

In total, male woolgrowers possess higher levels of average total wool production, average wool productivity per sheep and average total herd herd size than female woolgrowers, as illustrated by Figure 5.1.

Table 5.1 confirms this observation by demonstrating that the increase in wool production is statistically more significant among male woolgrowers than female woolgrowers.

Table 5.1: Differences in average wool production per woolgrower, wool productivity per sheep and herd size per woolgrower by gender, 2013-2017

Year	**2013**		**2017**		**Difference**
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Female					
Average wool production per woolgrower	87.845	121.645	105.520	107.939	-17.675
Average wool productivity per sheep	2.143	0.098	2.380	0.170	-0.237***
Average herd size per woolgrower	40.100	53.500	43.050	41.449	-2.950
Observations	60		60		120
Male					
Average wool Production per woolgrower	105.422	103.423	161.146	177.776	-55.724*
Average wool productivity per sheep	2.146	0.108	2.487	0.226	-0.340***
Average herd size per woolgrower	48.683	47.434	63.095	68.093	-14.413
Observations	63		63		126

*** p<0.01, ** p<0.05, * p<0.1

As indicated in Table 5.1, the results suggest that male woolgrowers are relatively more productive in sheep farming than female woolgrowers.

5.3 Marital status of woolgrower

This section discusses the relationship between the marital status of a woolgrower and their level of average total wool production, wool productivity per sheep and average total herd size. The marital status variable is divided into two binary categories, married and unmarried woolgrowers. The unmarried category includes divorced or widowed woolgrowers. Belonging to any of the two categories has a significant bearing on the dynamics of wool production due to differences in resource endowments and labour allocation.

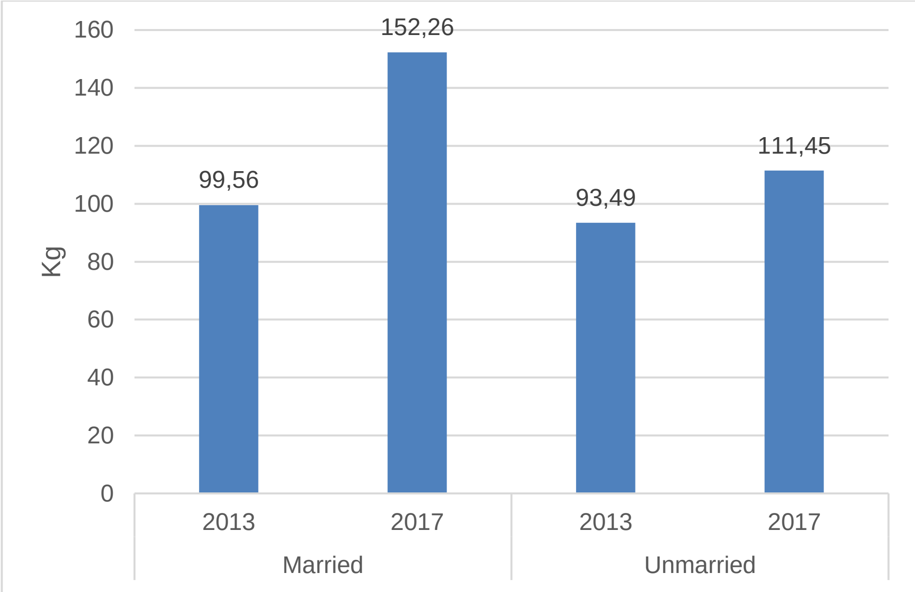

Figure 5.4: Average wool production per woolgrower by marital status, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

From Figure 5.4 it is noted that married woolgrowers have a relatively higher average total wool production index on average relative to unmarried woolgrowers. This trend persists over the duration of the period under observation, as evidenced by the percentage increase of 52.93% in total wool produced by married woolgrowers, while the output of unmarried woolgrowers increased by 19.21% between 2013 and 2017.

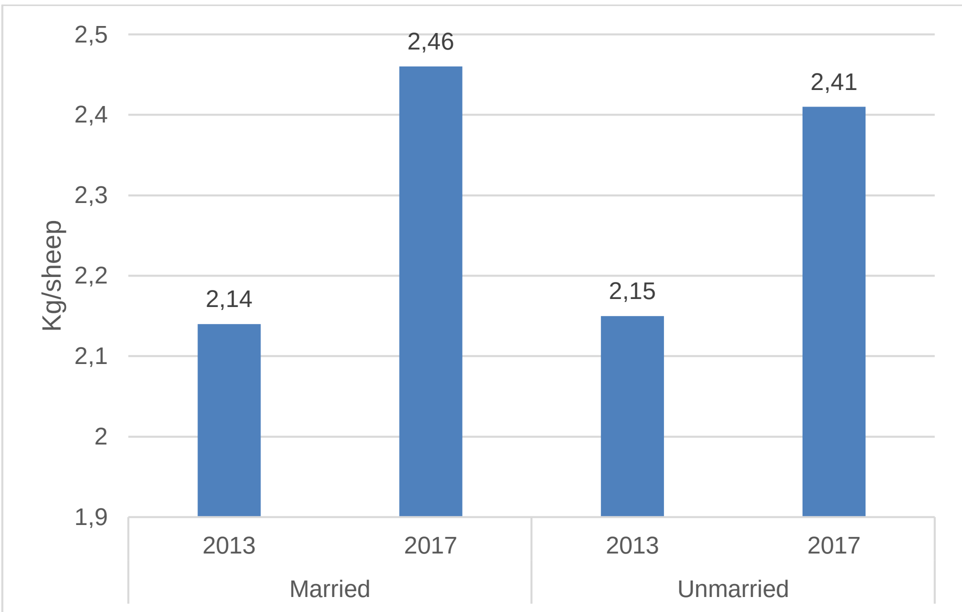

Figure 5.5: Average wool productivity per sheep by marital status of woolgrower, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Likewise, a similar trend is noted in wool productivity levels, where the average productivity levels per sheep increased by 14.95% among married woolgrowers, while the percentage increase among unmarried woolgrowers was 12.09% over the period under observation, as illustrated by Figure 5.5.

Married woolgrowers also appear to possess a larger herd size on average than unmarried woolgrowers. As illustrated by Figure 5.2, average herd size among married woolgrowers increased from 46 sheep per woolgrower in 2013 to 60 sheep per woolgrower in 2017, representing a percentage increase of 31.33%.

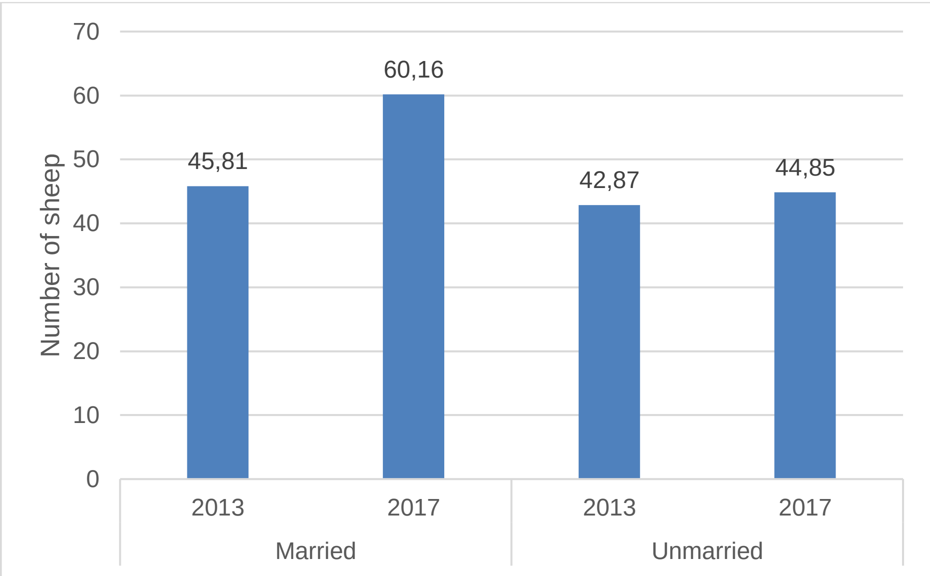

Figure 5.6: Average herd size per woolgrower by marital status, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Meanwhile, unmarried woolgrowers have only experienced an increase of 4.62% in average total herd size per woolgrower 42.87 sheep per woolgrower in 2013 to 44.85 sheep per woolgrower by 2017.

Table 5.2 further substantiates the observation that married woolgrowers possess higher average wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower through a paired t-test of statistical significance.

Table 5.2: Differences in average wool production per woolgrower, wool productivity per sheep and herd size per woolgrower by marital status, 2013-2017

Year	**2013**		**2017**		**Difference**
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Married					
Average wool Production per woolgrower	99.562	94.227	152.263	154.991	-52.701*
Average Productivity per sheep	2.138	0.106	2.457	0.217	-0.319***
Average herd size per woolgrower	45.809	42.263	60.162	58.294	-14.353
Observations	68		68		136
Unmarried					
Average wool production per woolgrower	93.493	132.618	111.445	141.540	-17.953
Average wool productivity per sheep	2.153	0.099	2.408	0.191	-0.254***
Average herd size per woolgrower	42.873	59.427	44.855	55.508	-1.982
Observations	55		55		110

*** p<0.01, ** p<0.05, * p<0.1

Table 5.2 illustrates that the increase in average total wool production per woolgrower over the duration of the period under observation was significant among married woolgrowers. This finding implies that the average increase in average wool productivity per sheep and average total herd size among unmarried woolgrowers is not large enough to shift their overall wool production function. The discovery further indicates wool production rapidly improved among married woolgrowers. The possible reasons behind such progression will be extensively explored in section 5.8 of this chapter.

5.4 Employment status of woolgrower

The study analyses variations in average total wool production, wool productivity per sheep and average total herd size across woolgrowers of differing employment statuses. This analysis recognizes that woolgrowers may have varying levels of commitment to wool production depending on the diversity of their livelihood strategy.

In Figure 5.3, the study reveals that the proportion of wool output yielded by woolgrowers categorized as having no other form of employment increased by 41.02%, which is higher than the increase among woolgrowers with part-time employment (39.44%) and full-time employment (29.42%). This finding indicates that unemployed woolgrowers are more skilled in sheep management techniques that augment the production capacity of their stock. This may further indicate that unemployed woolgrowers attend more extension service training sessions aimed at improving their output relative to their employed counterparts.

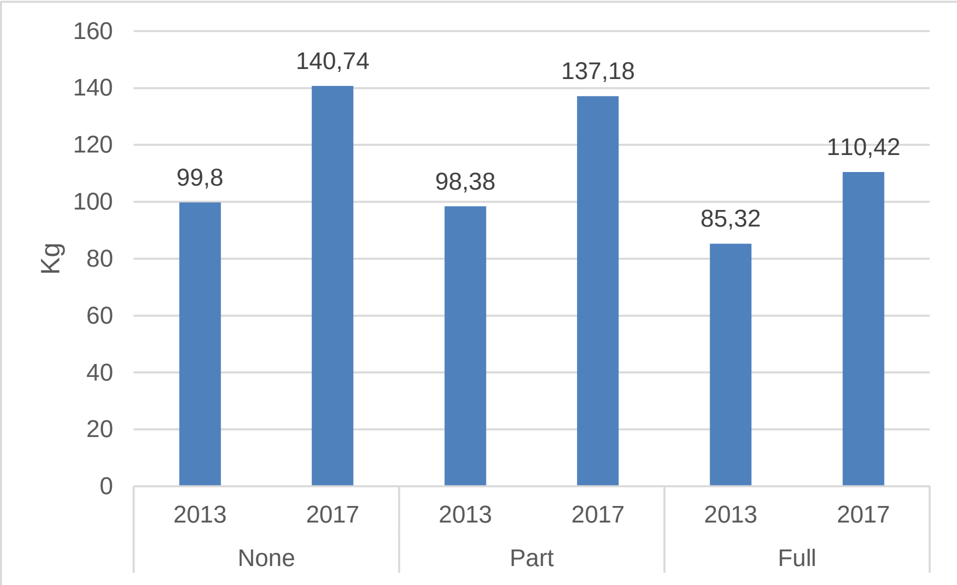

Figure 5.7: Average wool production per woolgrower by employment status, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

However, as illustrated by Figure 5.8, it is noted that the observed increase in average wool productivity per sheep was similar among unemployed woolgrowers (14.02%) and those with full-time employment (15.57%) but relatively lower among those with part-time employment (8.22%).

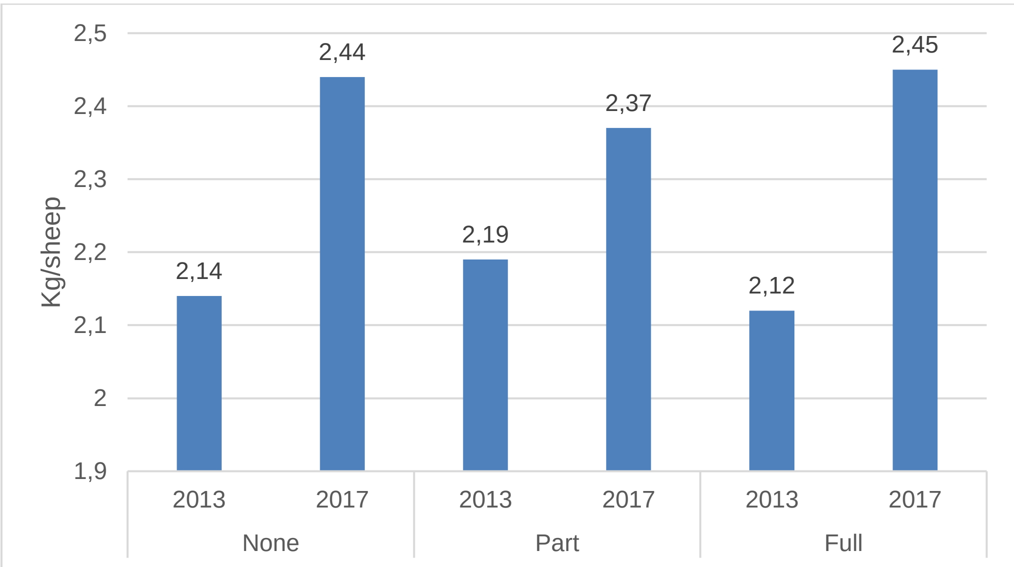

Figure 5.8: Average wool productivity per sheep by employment status of woolgrower, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

The considerably higher average figure of wool productivity per sheep among woolgrowers under full-time employment is a likely result of such woolgrowers allocating earnings from the off-farm labour market toward on-farm operations.

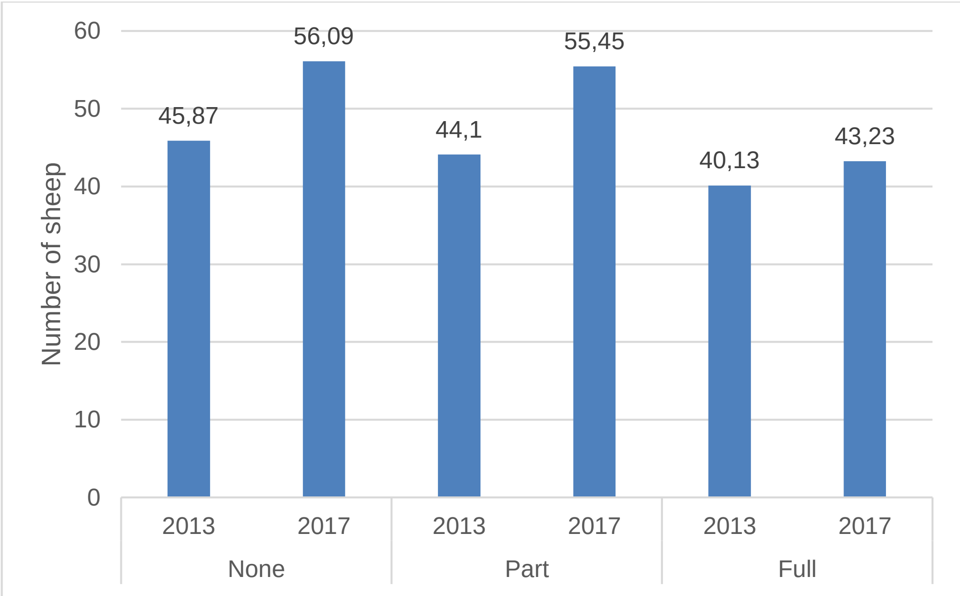

Figure 5.9: Average herd size per woolgrower by employment status, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

From Figure 5.9 it is noted that the largest average increase of average total herd size per woolgrower between 2013 and 2017 occurred among part-time employed woolgrowers (11,35 heads), followed by unemployed woolgrowers (10, 22 heads), while for employed woolgrowers employed on a full-time basis average total herd size increased by 3.1 heads.

Table 5.3: Differences in average wool production per woolgrower, wool productivity per sheep and herd size per woolgrower by employment status, 2013-2017

Year	2013		2017		Difference
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Unemployed					
Average wool production per woolgrower	99.798	123.380	140.737	159.538	-40.940
Average wool productivity per sheep	2.140	0.108	2.439	0.212	-0.299***
Average herd size per woolgrower	45.873	55.223	56.093	61.421	-10.220
Observations	79		86		165
Part-time employed					
Average wool production per woolgrower	98.376	84.833	137.182	157.521	-38.806

Table 5.3 (cont.)

Average wool productivity per sheep	2.187	0.091	2.367	0.159	-0.180**
Average herd size per woolgrower	44.095	36.609	55.455	58.936	-11.359
Observations	21		11		32
Full-time employed					
Average wool production per woolgrower	85.322	97.848	110.423	111.697	-25.101
Average wool productivity per sheep	2.123	0.086	2.449	0.209	-0.326***
Average herd size per woolgrower	40.130	45.417	43.231	41.194	-3.100
Observations	23		26		49

*** p<0.01, ** p<0.05, * p<0.1

As illustrated in Table 5.3, there was a significant increase in average wool productivity per sheep across all the employment status categories. However, the observed increases in average total wool production per woolgrower and average total herd size per woolgrower were not statistically significant across all the employment status categories analysed. However, over the period under review, the mean total herd size for woolgrowers classified as unemployed had increased by 22.28%, woolgrowers categorized as part-time employed experienced an increase of 25.74%, and lastly woolgrowers employed on a full-time basis experienced an increase of 7.73% in average total herd size.

This finding indicates that woolgrowers whose main source of livelihood income is the off-farm labour market are likely to be practicing wool production as an additional, not main, income-generating activity.

5.5 Education of woolgrower

Differences in average total wool production, average wool productivity per sheep and average total herd size per woolgrower could be the function of disparities in the educational levels of woolgrowers. The hypothesis underlying this claim is that woolgrowers who possess formal educational qualifications are likely to adopt innovative wool production techniques that result in favourable outcomes. The following figures provide a graphical representation of the association between the educational level of woolgrowers and wool production.

We note that there is a consistent upward trend in wool output among woolgrowers across all categories of educational levels, as illustrated by Figure 5.10. The largest increase in average total wool production occurred among woolgrowers in possession of primary education with a percentage increase of 62.33%.

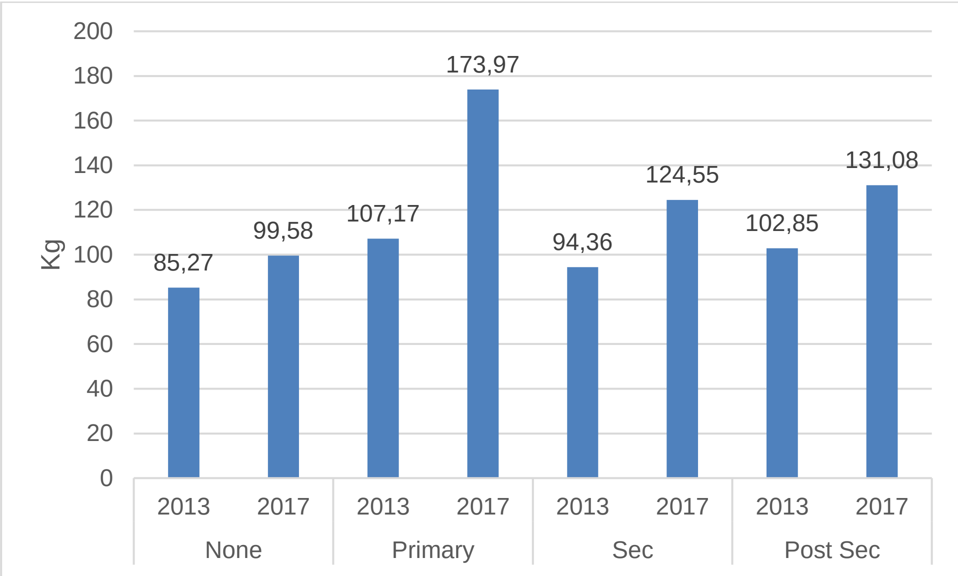

Figure 5.10: Average wool production per woolgrower by educational level, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

The observed increase is likely a result of the large number of woolgrowers in the sample who attained primary education compared to other education levels. This finding validates the claim that possessing formal educational qualifications, even at the primary level, increases the rate of adopting innovation among subjects of an intervention.

A similar trend is observed when the average total herd size per woolgrower is analysed by educational levels.

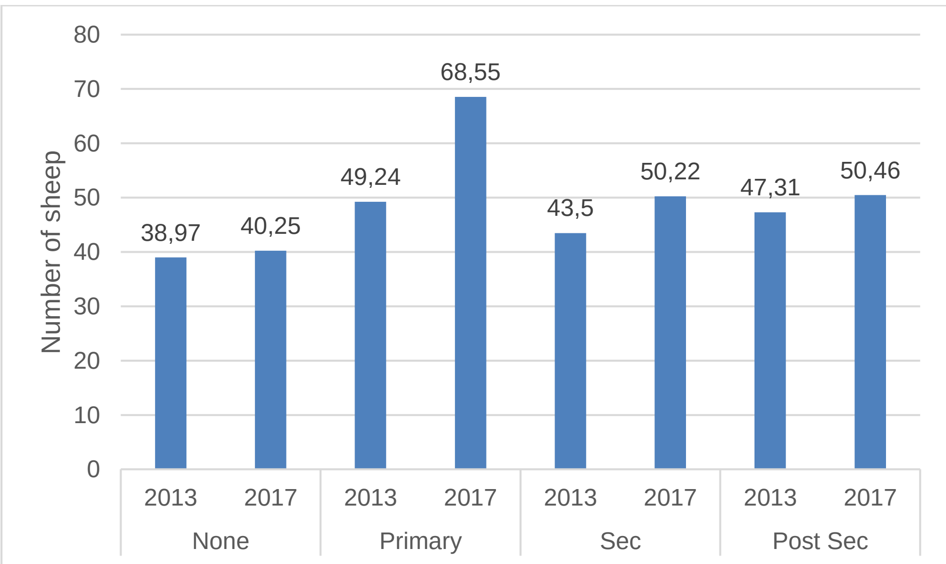

Figure 5.11: Average herd size per woolgrower by educational level, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

As illustrated by Figure 5.11, the largest percentage increase (39.22%) in average total herd size occurred among woolgrowers with primary education qualifications, followed by woolgrowers possessing secondary education qualification (15.45%); woolgrowers with tertiary education qualification (6.66 %); and lastly, woolgrowers with no education qualifications (3.28%).

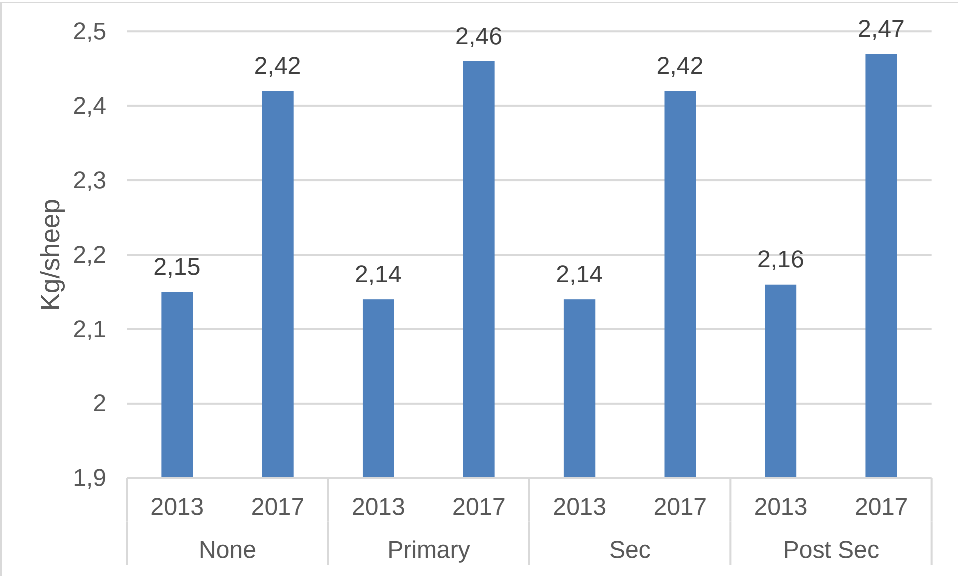

Figure 5.12: Average wool productivity per sheep by educational level of woolgrower, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

Table 5.4: Differences in average wool production per woolgrower, wool productivity per sheep and herd size per woolgrower by educational level, 2013-2017

Year	**2013**		**2017**		**Difference**
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
No formal education					
Average wool production per woolgrower	85.269	123.251	99.584	58.255	-14.315
Average wool productivity per sheep	2.148	0.098	2.416	0.210	-0.269***
Average herd size per woolgrower	38.969	53.286	40.250	20.888	-1.281
Observations	32		32		64
Primary education					
Average wool production per woolgrower	107.168	122.834	173.966	216.201	-66.797
Average wool productivity per sheep	2.136	0.105	2.455	0.222	-0.319***
Average herd size per woolgrower	49.237	56.517	68.553	83.325	-19.316
Observations	38		38		76

Table 5.4 (cont.)

Secondary education					
Average wool production per woolgrower	94.358	96.988	124.550	118.318	-30.192
Average wool productivity per sheep	2.145	0.104	2.419	0.191	-0.274***
Average herd size per woolgrower	43.500	43.513	50.225	45.491	-6.725
Observations	40		40		80
Post-secondary					
Average wool production per woolgrower	125.143	133.334	147.643	154.164	-28.231
Average wool productivity per sheep	2.196	0.165	2.448	0.218	-0.305***
Average herd size per woolgrower	55.214	55.466	58.786	60.700	-3.154
Observations	14		14		28

*** p<0.01, ** p<0.05, * p<0.1

When average wool productivity per sheep is analysed across woolgrowers' education levels, a similar upward-leaning trend is noted. Wool productivity per sheep increased by 14.95% for woolgrowers with primary education qualifications, followed by woolgrowers with tertiary education qualification (14.35%); woolgrowers with secondary education qualification (13.08%).

5.6 Age of woolgrower

Average total wool production, average wool productivity per sheep and average total herd size per woolgrower may vary depending on the age of woolgrowers. The study classifies woolgrowers into 1) working-age category defined as woolgrowers between the ages of 15 to 65 years old, and 2) non-working age category defined as woolgrowers above the retirement age of 65 years and older.

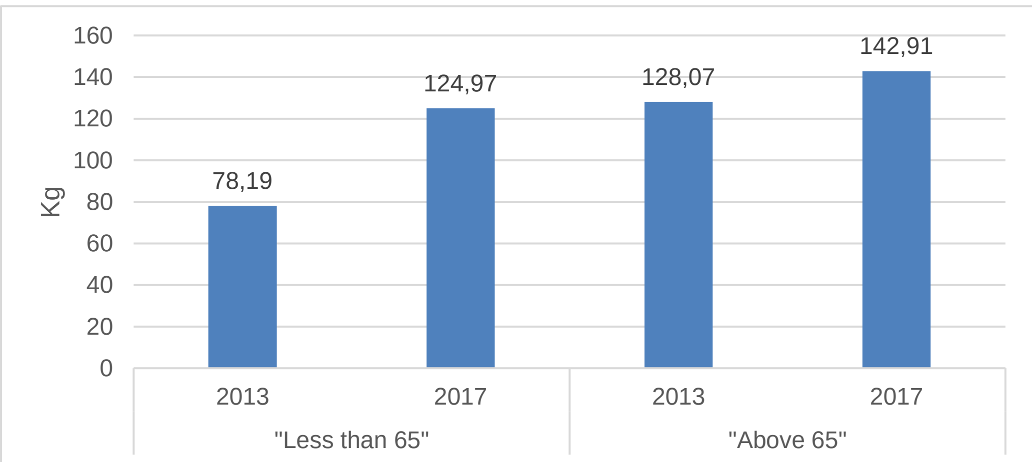

Figure 5.13: Average wool production per woolgrower by age, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

Figure 5.13 is an illustration of the share of average total wool production between the working-age and non-working age categories. From the results, it is noted that the non-working age category produces 91% of wool clip, the remaining 9% is attributed to woolgrowers in the working-age category. The dominance of woolgrowers classified under the non-working age category in wool production may be attributed to experience as well as high cash reserve which are then used as operating capital in wool production. Nevertheless, it is important to note that there is a substantial increase in the proportion of wool produced by woolgrowers in the working-age category, from an average of 78.19 kg per woolgrower in 2013 to 124.97 kg per woolgrower in 2017. This finding may indicate a gradual transition away from off-farm activities to wool production among woolgrowers in the working-age category.

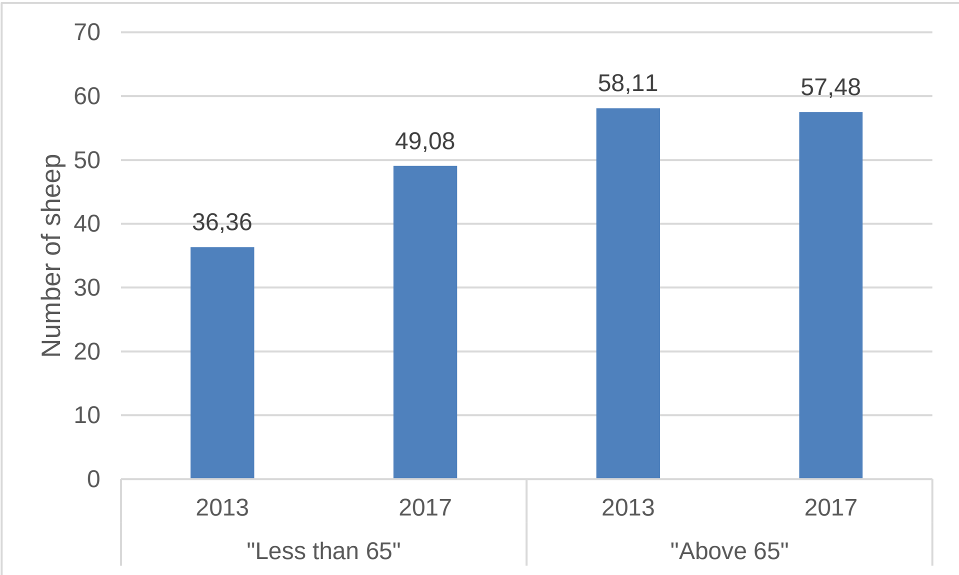

Figure 5.14: Average herd size per woolgrower by age, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Figure 5.14 further reveals the variation in average total herd size per working-age or non-working age category. The proportion of woolgrowers classified as non-working age, that is, above the age of 65 years old, possesses a higher total herd size count on average than their counterparts in the working-age category.

The observed large herd size among non-working age woolgrowers may likely be due to the high probability of these individuals to wool produce wool on a full-time basis relative to their younger counterparts. In addition, their experience in sheep production, coupled with a lifetime of asset accumulation, allows them to invest extensively in wool production and use advanced breeding and management techniques.

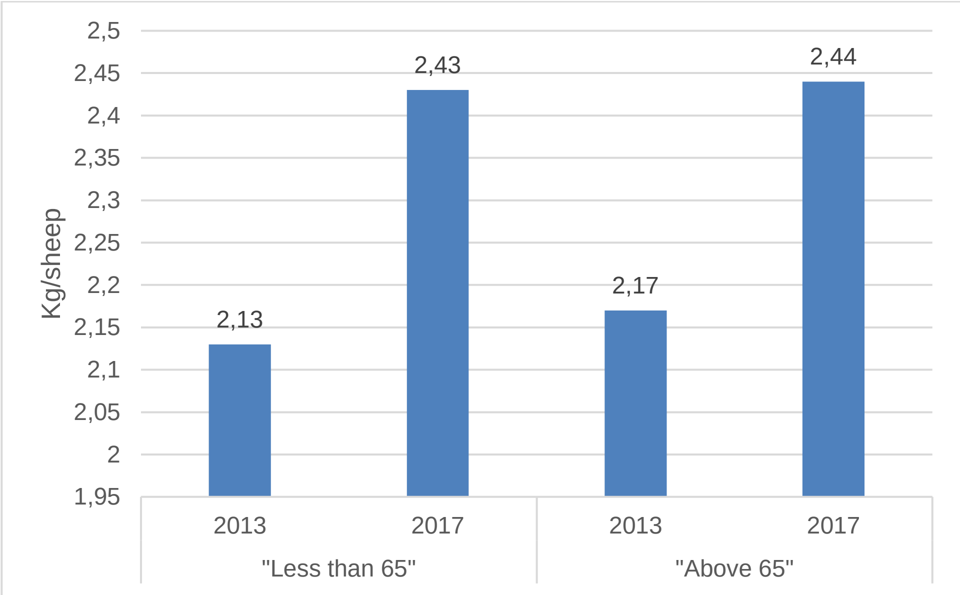

Figure 5.15: Average wool productivity per sheep by age of woolgrower, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolsheds

Despite woolgrowers in the non-working age woolgrowers possessing higher average levels of wool production per woolgrower, e herd size per woolgrower and wool productivity per sheep, woolgrowers in the working-age category had the highest percentage increase in all these factors over the period under review.

For example, average total wool production per woolgrower among the working-age category increased by 59.83%, which is higher than the 11.59% increase observed in the non-working age category. Average wool productivity per sheep also increased by 14.08% for the woolgrowers in the working-age category in comparison to 12.44% for the non-working age category. Similarly, average total herd size increased by 34.98% for woolgrowers in the working-age category while it declined by 1.08% among woolgrowers in the non-working age category.

Table 5.5: Differences in average wool production per woolgrower, wool productivity per sheep and herd size per woolgrower by age, 2013-2017

Year	2013		2017		Difference
Variable	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Below 65 years old					
Wool production per woolgrower	78.195	77.594	124.970	163.437	-46.776*
Wool production productivity per sheep	2.129	0.098	2.427	0.200	-0.297***
Average herd size per woolgrower	36.364	35.493	49.082	61.110	-12.718
Observations	77		61		138
Above 65 years old					
Wool production per woolgrower	128.072	150.295	142.906	136.067	-14.834
Wool production productivity per sheep	2.170	0.108	2.443	0.215	-0.272***
Average herd size per woolgrower	58.109	66.880	57.484	53.554	0.625
Observations	46		62		108

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5.5 validates the observed percentage increases in variables of interest among woolgrowers in the working-age category by illustrating that the shift in average total wool production and average wool productivity per sheep observed for this category was statistically significant throughout the duration of the period under observation.

5.7 Income transfers

Disparities in levels of average total wool production, average wool productivity per sheep and average total herd size per woolgrower among woolgrowers may be a function of additional income through social welfare transfers (social grants) or remittances. The data was unpacked and analysed by recipients and non-recipients of social grants and remittances to investigate the nature of the relationship between the commercialization of wool production and additional household income transfers.

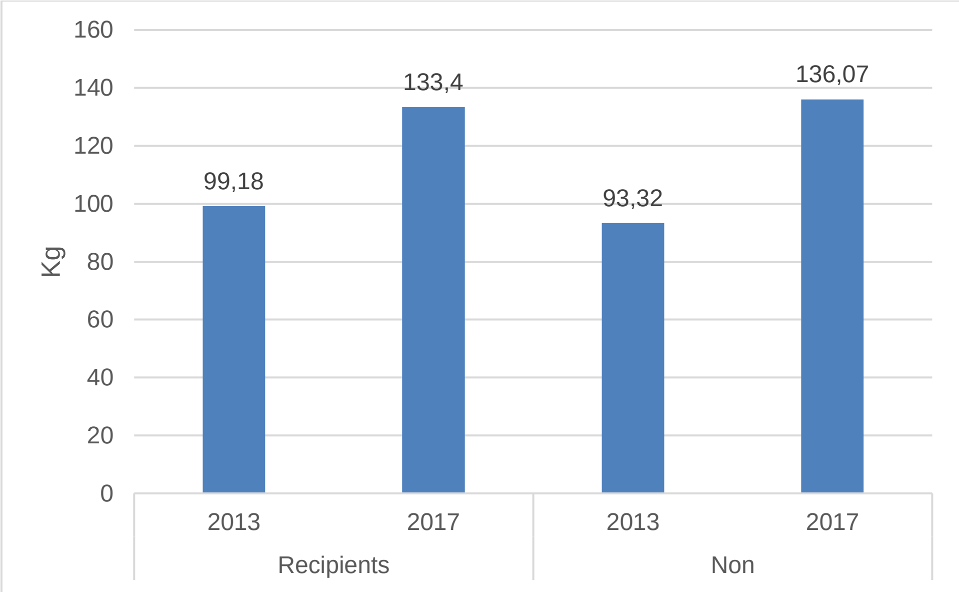

Figure 5.16: Average wool production per woolgrower by social grant, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

From Figure 5.16 it is noted that recipients and non-recipients of social grants produced similar output levels, however, over the duration of the period under review, non-recipients of social grants recorded a higher percentage increase of 45.81% over their social grant-receiving counterparts, whose percentage increase in wool output was 34.50% between 2013 and 2017. A possible explanation for this observation may be that non-recipients of social grants are likely to be woolgrowers in the working-age category who, as previously reported, are likely to use their earnings from the off-farm labour market to finance wool production, thus resulting in favourable outcomes.

A similar trend is noted when wool productivity is analysed among recipients and non-recipients of social grants.

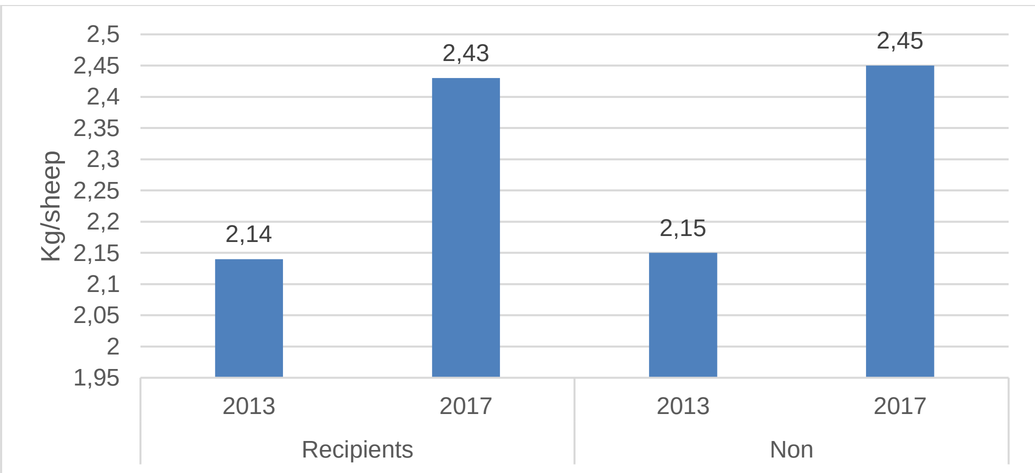

Figure 5.17: Average wool productivity per sheep by social grant, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

As illustrated by Figure 5.17, mean wool productivity per sheep increased for both recipients and non-recipients of social grants between 2013 and 2017. Although observed differences in mean wool productivity per sheep between the two categories is relatively unsubstantial, it is important to note that the increase in average mean wool productivity per sheep was higher among non-recipients of social grants than recipients. This finding may indicate that the operations of whoolgrowers classifid as non-recipients of social grants prioritizes the optimization of wool productivity per sheep.

When average total herd size is analysed along social grant and non-social grant recipients, the study notes modest differences in the total mean herd size between recipients and non-recipients.

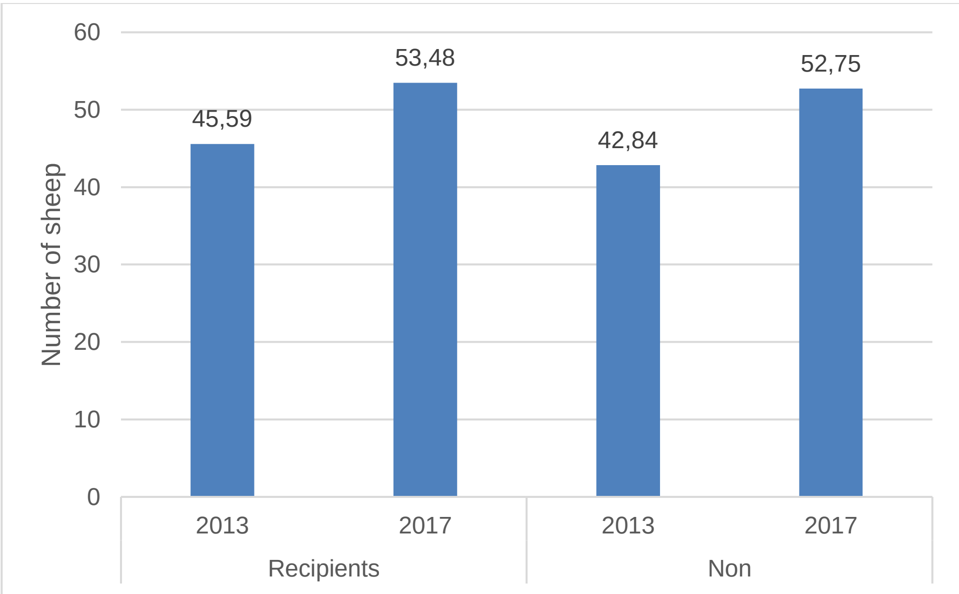

Figure 5.18: Average herd size per woolgrower by social grant, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

Figure 5.18 illustrates an increase in average total herd size across both categories under review, with non-social grant recipients recording a higher average increase of 23.13% compared to recipients of social grants whose herd size increased by 17.31% between 2013 and 2017.

When the relationship between the factors of interest and remittance transfers is analysed, a percentage increase of 29.63% in wool clip produced by recipients of remittances is observed, which is relatively higher than the average percentage increase observed among non-recipients of remittances.

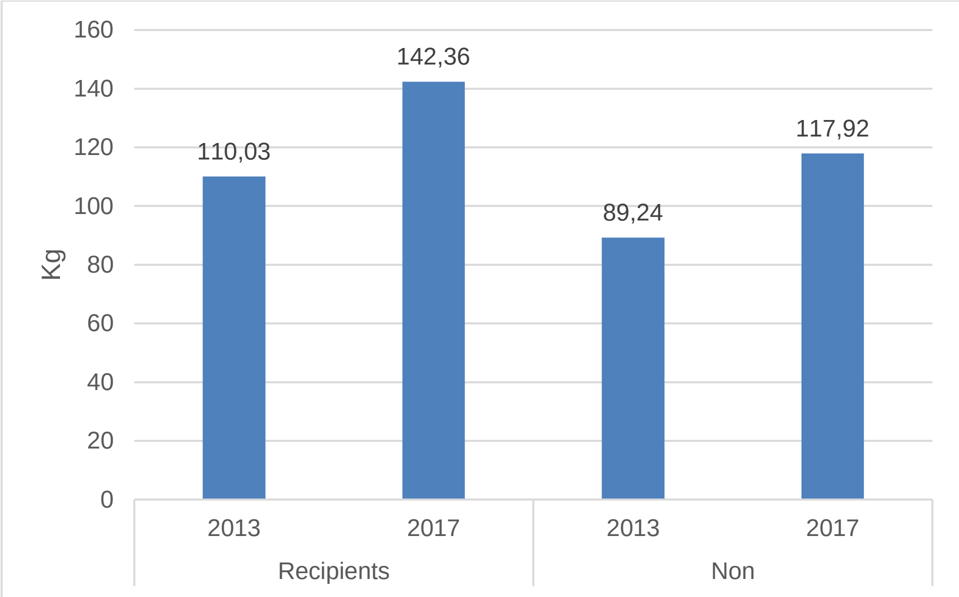

Figure 5.19: Average wool production per woolgrower by remittances, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

This finding demonstrates a positive relationship between remittance inflows and total wool production, indicating recipients of remittances use earnings from household income inflows to invest in wool operations.

The analysis of total herd size among recipients and non-recipients of remittances reveals a trend consistent with the one observed in Figure 5.18 is observed.

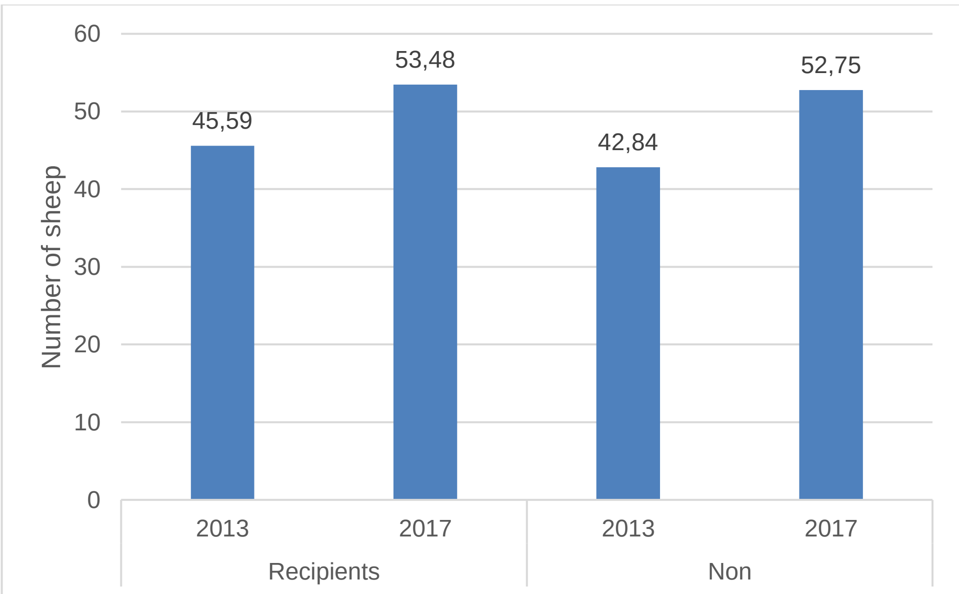

Figure 5.20: Average herd size per woolgrower by remittances, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

Average herd size increased by 9,93 stock units among non-recipients of remittances against 7,89 among remittance beneficiaries, as illustrated by Figure 20. Nevertheless, from analyses in Figure 5.19 and Figure 5.20 it is noted that social grants and remittance recipients have larger total herd sizes in real terms compared to their non-recipient counterparts.

Therefore, the presence of this discovery warrants the conclusion of a positive association between welfare income transfers and to total herd size per woolgrower, which may then suggest that woolgrowers invest a certain proportion of income inflows to sheep production.

However, there are no significant differences in average wool productivity per sheep between recipients and non-recipients of social grants or remittances. The levels of wool productivity per sheep and trends characterising their progressions have been similar in their trajectory over the period under observation.

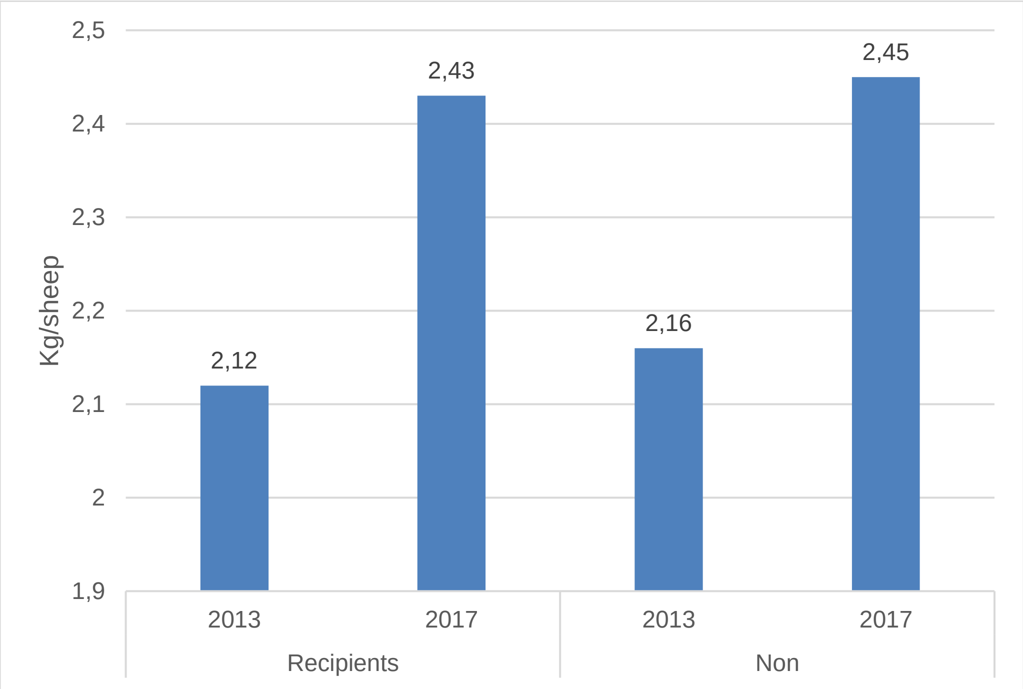

Figure 5.21: Average wool productivity per sheep by remittances, 2013-2017
Source: Author's own compilation using data collected at Allen Waters and Ensaam woolshed

Table 5.6 is an illustration of results from the test of significance reviewing changes in average total wool production, average wool productivity per sheep and average total herd size across recipients and non-recipients of social grants and remittances between 2013 and 2017.

From the results it is noted that there are no statistically significant changes in average total wool production per woolgrower and average total herd size per woolgrower across the categories observed. Statistical significance is only observed in changes that occur in average wool productivity per sheep, as it consistently has been throughout all the socioeconomic variables it was contrasted against.

Table 5.6: Differences in average wool production, wool productivity per sheep and herd size per woolgrower by income transfers, 2013-2017

Year	2013		2017		
Variable	**Mean**	**SD**	**Mean**	**SD**	**Difference**
Social grant recipients					
Average wool production per woolgrower	99.184	119.117	133.404	146.089	-34.220
Average wool productivity per sheep	2.142	0.108	2.430	0.210	-0.288***
Average herd size per woolgrower	45.595	53.240	53.484	57.076	-7.890
Observations	74		95		169
Non-recipients of social grant					
Average wool production per woolgrower	93.320	102.967	136.071	165.065	-42.751
Average wool productivity per sheep	2.149	0.096	2.452	0.198	-0.303***
Average herd size per woolgrower	42.837	46.434	52.750	59.301	-9.913
Observations	49		28		77
Remittance recipients					
Average wool production per woolgrower	110.027	118.815	142.357	156.569	-32.330
Average wool productivity per sheep	2.118	0.103	2.426	0.190	-0.307***
Average herd size per woolgrower	51.044	54.391	56.889	59.473	-5.844
Observations	45		81		126
Non-recipients of remittances					
Wool production per farmer	89.245	108.846	117.917	136.535	-28.672
Average wool productivity per sheep	2.160	0.100	2.452	0.237	-0.292***
Average herd size per woolgrower	40.718	48.003	46.429	53.007	-5.711
Wool production per farmer	78		42		120

*** p<0.01, ** p<0.05, * p<0.1

5.8 Factors behind significant changes in wool production and wool productivity

The previous sections have indicated that over the period under observation, the change in average wool production per woolgrower is significant for three sociodemographic characteristics: male woolgrowers, married woolgrowers and woolgrowers in the working age population, defined as individuals between the ages of 15-65 years. This section analyses possible factors underlying the significant differences in gender, marital status and employment status as observed in the results using two-tailed tests of significance for the period under review, 2013-2017. Since there was no significant change in wool production for all the other socio-demographic characteristics except for male, married and working-age woolgrowers, this section exclusively focuses on these three categories to be able to identify key factors that determine wool production.

Table 5.7 below analyses changes in several factors, each with the potential to justify the statistical significance in the observed change among woolgrowers in the working-age category between 2013 and 2017. From the results, it is noted that household income among woolgrowers in the working-age category increased significantly from 2013 to 2017. This surge in household income appears to be correlated with wool production output. Furthermore, a substantial rise in the average number of recipients of remittances among woolgrowers of working age categorization, some of which may have been invested in wool production to improve productivity per sheep and output levels, is observed.

Table 5.7: Factors across working-age woolgrowers

Year	2013		2017		Difference
Unmarried	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Household size	4.169	1.902	1.95	0.12	-0.362
Household income	23537.789	25750.457	47,380.21	- 28345.593***	(-4.206)
Unemployed	0.506	0.503	0.5	-0.002	(-0.020)
Part-time employed	0.234	0.426	0.32	0.119	-1.87
Full-time employed	0.26	0.441	0.49	-0.117	(-1.461)
Social grant recipient	0.468	0.502	0.5	-0.09	(-1.045)
Remittance recipient	0.429	0.498	0.48	-0.211*	(-2.508)
Observations	77		61	138	

*** p<0.01, ** p<0.05, * p<0.1

Table 5.8 presents results from the examination of several variables analysed across male woolgrowers in the sample. The results indicate that male woolgrowers experienced a significant increase in household income, which may have led to the large and statistically significant increase in average wool production relative to other categories in the sample. The results also reveal that a majority of male woolgrowers in the sample are recipients of social grants and remittances, and the presence of these income inflows may be the underlying cause for increased wool production among male woolgrowers.

Moreover, a notable observation is the change in the employment status of male woolgrowers between 2013 and 2017. A majority of male woolgrowers who were classified as casually or part-time employed in 2013 experienced a change in employment status to either full-time employed or unemployed by 2017. This transition in status of employment presented a double-edged benefit in that full-time employment allowed the transference of earnings from the off-farm labour market to wool production, specifically the purchase of inputs and genetically improved rams. Similarly, unemployment granted unemployed woolgrowers the opportunity to allocate their full-time and resources to wool production as a primary income-generating livelihood strategy.

Table 5.8: Factors across male woolgrowers

Year	**2013**		**2017**		**Difference**
Male	**Mean**	**SD**	**Mean**	**SD**	**T-test**
Household size	4.333	1.849	4.333	1.849	0.000
Household income	28768.370	26752.768	61139.204	42231.872	-32370.833***
Unemployed	0.508	0.504	0.619	0.490	-0.111
Part-time employed	0.206	0.408	0.079	0.272	0.127*
Full-time employed	0.286	0.455	0.302	0.463	-0.016
Social grant recipient	0.524	0.503	0.730	0.447	-0.206*
Remittance recipient	0.302	0.463	0.540	0.502	-0.238**
Observations	63		63		126

*** p<0.01, ** p<0.05, * p<0.1

Table 5.9 presents the results of potential determinants to the statistical significance of observed changes in wool dynamics among married woolgrowers. Similar to male woolgrowers, there was a parallel, statistically significant increase in household income, social grant, and remittance income flows among married woolgrowers. In addition, there was an occupation status shift on a large proportion of married woolgrowers in the sample who were categorized as part-time employed in 2013, to a categorization of ‘unemployed’ by 2017.

This may be attributed to multiple factors, from retirement from the off-farm labour market to simply loss of employment in line with South Africa’s surging unemployment rate. Nevertheless, the shift from full-time employment to employment may have prompted married woolgrowers to devote their full time to wool production for sustenance.

Table 5.9: Factors across married woolgrowers

Year	**2013**		**2017**		**Difference**
Married	Mean	SD	Mean	SD	T-test
Household size	4.868	1.836	4.868	1.836	0.000
Household income	27208.781	22767.767	60003.797	33523.956	-32795.016***
Unemployed	0.632	0.486	0.721	0.452	-0.088
Part-time employed	0.176	0.384	0.044	0.207	0.132*
Full-time employed	0.191	0.396	0.235	0.427	-0.044
Social grant recipient	0.588	0.496	0.765	0.427	-0.176*
Remittance recipient	0.412	0.496	0.750	0.436	-0.338***
Observations	68		68		136

*** p<0.01, ** p<0.05, * p<0.1

5.9 Summary

This chapter discussed the dynamics of wool production, wool productivity and herd size across various sociodemographic factors. Through critical analysis of variations in levels of average wool production per woolgrower, wool productivity per sheep, and herd size per woolgrower across definitive social and economic characteristics, the chapter adequately identified the underlying determinants of increased wool production at the two woolsheds, Allen Waters and Ensaam, that served as the unit of analysis.

Key findings of the chapter reveal a significant increase in average wool productivity per sheep over a wide range of variables analysed against the three main demographics of interest: male woolgrowers, married woolgrowers, and wool growers of non-working age category. The chapter further identified wool productivity per sheep, household income, access to income transfers, such as social grants and remittances, as well as employment status as the prime determinants of the statistical significance of wool production among male, married, and working-age woolgrowers at Allen Waters and Ensaam woolsheds.

The analytical insights contained in this section reveal that levels in household income, wool productivity, employment status of the woolgrowers as well as social grants and remittances are the prime determining factors influencing wool production at Allen Waters and Ensaam woolsheds.

The combination of these factors influences the degree to which interventions with the aim of commercialising wool production in communal areas of the Eastern Cape may be successful at optimally achieving this aim.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This study endeavoured to establish factors that determine the progression of wool dynamics at the Allen Waters and Ensaam woolsheds post the National Woolgrowers Association (NWGA) LandCare intervention. A preliminary investigation of this study has shown that wool production has different outcomes for different segments of the population and that these differences are divided along socioeconomic characteristics. Thus, the main objective of the study was to establish factors that determined improvements in wool production among beneficiaries of the NWGA intervention.

The specific objectives of the study were two-pronged, the first was aimed at investigating whether wool production in communal areas of the Eastern Cape is a function of wool productivity, herd size or the combination of both factors. The second specific objective of the study sought to investigate which socioeconomic demographics of woolgrowers determined the outcome in wool production, wool productivity and herd size.

To answer its objectives, the study used a combination of primary data collected by the researcher as well as secondary data obtained from BKB (Pty) Ltd. Primary data was collected from 123 woolgrowers at the Allen Waters and Ensaam woolsheds. Primary data was collected from a sample of 123 woolgrowers across both study areas, while secondary data was composed of longitudinal records spanning over a five-year period, from 2013 to 2017. The data was dissected with the aid of a descriptive technique in order to enable thorough analysis providing sufficient insights to answer the study's main objectives.

Chapter 2 provided a comprehensive literature review of the history of sheep production in communal areas of the Eastern Cape, from arrival of the first consignment of Merino breeds from Spain in 1789 to their distribution to the rest of South Africa as the Vootrekkers were migrating Northward with their flock during the Great Trek of 1834. Thereafter, the role of livestock, of which sheep is a crucial component of, in South Africa's communal areas, sheep is a crucial component of, in South Africa's communal areas, sheep is a crucial component of, in South Africa's communal areas, sheep is a crucial component of, in South Africa's communal areas was extensively reviewed. Insights provided by the review revealed that livestock production plays a vital role in the social, economic and cultural landscape of South Africa's communal areas. It was further revealed that institutional interventions to develop previously disadvantaged areas used the extensive role of livestock in communal areas as a strategy to transition agricultural production in these areas from subsistence farming into commercial enterprises by vertically integrating them into formal marketing channels. Thus, the study reviewed the role of the NWGA's LandCare intervention to promote the commercialisation of wool production in communal areas of the Eastern Cape province (D'Haese, *et al.*, 2001).

6.2. Summary of major findings

Due to the study's prime objective being double-barrelled — to investigate the relationship of changes between wool production, wool productivity and herd size and evaluating the degree to which socioeconomic demographics of woolgrowers determined changes in wool production among woolgrowers in communal areas — results of the study were divided into two separate chapters. Chapter 4 focused on analysing progressions in wool production, wool productivity and herd among woolgrowers of the Allen Waters and Ensaam woolsheds over a five-year period, from 2013 to 2017. In Chapter 5, the focus tilted toward analysing socioeconomic characteristics of woolgrowers that determined changes in wool production, wool productivity and herd size over this period.

In Chapter 4, the study deconstructed aggregate changes in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower between 2013 and 2017. Graphical illustrations of the results revealed notable increases in average total wool production per woolgrower, average wool productivity per sheep and average total herd size per woolgrower among woolgrowers of Allen Waters and Ensaam over the period under review. However, when the significance of such changes was tested using paired t-test methods, the observed changes were only statistically significant for average total wool production per woolgrower and average wool productivity per sheep. However, observable changes in average total herd size per woolgrower over the period under observation were not statistically insignificant. This finding implies that the growth in total herd size occurred over a minority of woolgrowers in the sample while the growth in the majority of woolgrowers was largely insignificant.

The study further established that observed changes in wool dynamics at the two study areas, Allen Waters and Ensaam, are not statistically different from each other. Although there are notable disparities in quantities of average total wool produced, levels of wool productivity per sheep, as well as total herd size per woolgrower, changes in these factors over the period under review follow a similar pattern at both woolsheds.

The results of Chapter 4 provided insights on progressions in average wool production, wool productivity per sheep and average total herd size per woolgrower at the Allen Waters and Ensaam woolsheds between 2013 and 2017 respectively. Results of the aggregate analysis indicate that average wool production per woolgrower increased by 38.4% over the period under observation. Similarly, average wool productivity per sheep and average total herd size per woolgrower was shown to have each increased by 13.6% and 17.8% respectively. To test the statistical significance of the aggregate changes in the variables of interest over time, a series of paired t-tests were administered.

Results from the t-test to establish the statistical significance of the evolution of the aggregate outcome in wool production, wool productivity and herd size over time indicate that observed changes in wool productivity are more statistically significant at 1% significance level than changes in total wool production, which are significant at 10% level of significance.

Although aggregate total herd size has increased over the period under observation, this increase, however, was found to be statistically insignificant.

These findings suggest that, at the aggregate level, the evolution of wool production across the sampled areas is primarily driven by the improvements in wool productivity per sheep and not growth in herd size.

Chapter 4 also presented insights relating to longitudinal changes in the wool production, wool productivity and herd size between the two woolsheds between 2013 and 2017. Results of the analysis evaluating average total wool production, average wool productivity per sheep and average total herd size, indicate that average wool production at Allen Waters increased from an average of 117.8 kilograms per woolgrower in 2013 to an average of 159.6 kilograms per woolgrower in 2017. Meanwhile, average wool production increased from 73.16 kilograms in 2013 to 105.3 kilograms in 2017. Although the volume of wool produced by the Ensaam woolshed was relatively less than the volume produced by the Allen Waters woolshed, the study discovered that the growth rate of Ensaam woolshed was higher (43.9%) in comparison to the growth rate of Allen Waters woolshed (35.3%) in the period under observation. From the results, it is noted that average wool productivity levels evolved by a factor of 13.5% at the Allen Waters woolshed and 13.1% at Ensaam woolshed. Similarly, average total herd size at the Allen Waters and Ensaam woolsheds increased by 26.5% and 16.7% respectively.

As was the case with the analysis of aggregate wool dynamics in the two study areas, the evolution of such dynamics individually for each woolshed was evaluated with the aid of a paired t-test. Results from the paired t-tests indicated lack of evidence to suggest observed changes in wool production, wool productivity and herd size between Allen Waters and Ensaam woolsheds is not statistically insignificant.

Chapter 5 of the study examined the dynamics of wool production, wool productivity and herd size across several woolgrowers' sociodemographic factors. The section unpacked variations in production, productivity and herd size by woolgrower demographics, thereby identifying determinants of observed progressions in wool production.

Results from Chapter 5 of the study reveal that there was a general increase in average wool productivity across the demographic variables analysed and the increase in question was statistically significant.

The results revealed substantial improvements in the proportion of average total wool produced by the following categories of woolgrowers: male woolgrowers, married woolgrowers and working-age woolgrowers. These categories displayed high levels of average total wool production, average wool productivity per sheep, average household income and access to social grants and remittance transfers.

Results contained in Chapter 5 reveal that the average proportion of wool produced by male woolgrowers in the sample increased by a significantly higher percentage (52.9%) relative to the proportion produced by female woolgrowers (20.1%) between 2013 and 2017.

In addition, analytical results contained in Chapter 5 revealed that average wool productivity levels per sheep were higher among male woolgrowers (20.1%) than female woolgrowers (11.2%), while percentage growth in total herd size among female woolgrowers was significantly lower (7.4%) when compared with male woolgrowers (29.6%) over the period under observation. Paired t-test evaluation of the significance of the observed increase within these variables among male woolgrowers relative to their male counterparts was found to be statistically significant.

Average wool production was found to have significantly increased among married woolgrowers than unmarried woolgrowers with a percentage increase of 53% against 19.1% for unmarried woolgrowers; while average wool productivity levels per sheep for married woolgrowers increased by 14.9% against 12.1% for unmarried woolgrower; herd size increased by 31.3% for married woolgrowers against 4.6% for unmarried woolgrowers.

Further analytical insights contained in Chapter 5 revealed that levels of household income, wool productivity per sheep, employment status, and being a recipient of social grants and remittances are the prime determining factors influencing the commercialization and progression of wool production at Allen Waters and Ensaam woolsheds.

6.3 Practical implications of results

Although the National Woolgrowers Association’s intervention to promote wool commercialisation in communal areas of the Eastern Cape resulted in general improvements in the dynamics of wool production, further amendment of the intervention’s strategic framework is required in order to achieve optimum efficiency in the outcome of its objective. It is proposed, therefore, that the current strategic approach of institutional intervention to commercialise wool production in communal areas be revised and adapted to the findings of this study.

The findings of this study, which were derived from a sample of woolgrowers in two communal areas of the Eastern Cape province, have practical implications for two stakeholders: National Woolgrowers Association and the current national rural development policy framework. In lieu of a brush-stroke approach to the intervention to commercialise wool production in communal areas, findings of this study indicate that a more apt approach is clustering the targeted population according to its socioeconomic demographic characteristics and thereafter designing intervention strategies that aim to optimize objective outcomes for each population cluster. Results of careful analysis into determinants of the evolution of wool production in two communal areas of the Eastern Cape province reveal that the LandCare intervention commissioned by the NWGA had resulted in substantial improvements in wool production output, wool productivity per sheep and average herd size per woolgrower, and that this was primarily concentrated in three demographic categories: male woolgrowers, married woolgrowers and woolgrowers in the non-working age category. There are multiple inferences that may be made to explain the differences in the outcome of the NWGA LandCare intervention across the different socioeconomic categories.

Observed improvements in wool production, wool productivity per sheep as well as herd size among male woolgrowers may be explained through a binary perspective of cultural and economic conditions.

- Cultural factor: In African culture, males are *de facto* beneficiaries of livestock inheritance. Such a system invariably results in unequal distribution of livestock between the genders as male livestock keepers are likely to possess higher herd sizes than their female counterparts. Higher herd sizes grant male woolgrowers the privilege of higher wool clip yield and an equally higher probability of relatively wool productivity per sheep.
- Economic factor: The distribution of woolgrowers surveyed in the study who reported to derive a portion of their income from off-farm economic activities was overwhelmingly skewed toward the male gender. This implies that, in addition to inherited livestock, male woolgrowers could be using their off-farm earnings to invest in inputs that result in improved factors of wool production.

The observed improvements of wool production, wool productivity and herd size among married woolgrowers may be the result of asset and risk consolidation by woolgrowers classified as married. In households where the spouse of the household head is employed in the off-farm labour market, income inflows such as migrant remittances may be used to invest in breeding rams, veterinary medicines as well as other vital inputs of wool production.

Meanwhile, observed differences among woolgrowers in the non-working age category is indicative of woolgrowers who are:

- Highly experienced in sheep management breeding techniques that favour high wool productivity per sheep and high wool clip yield per season.
- Recipients of social welfare income transfers such as social grants, a proportion of which may be used to fund operational costs.
- Pensioners or retirees of the off-farm labour market who, through a lifetime of asset accumulation, may possess higher herd sizes than woolgrowers in other categories.

The advantages of each of these group categories may be transferred to other categories in the sample (with a higher focus on female woolgrowers in the working-age category) by incentivizing conditions that allow for equality of opportunity in the off-farm labour market in order to allow access to external funds, which may then be used to finance farm operations.

The practical significance of findings contained in this study, from an extension point of reference, allow for a comprehensive overview of how different categorical characteristics respond to institutional interventions. In turn, analysis of such characteristics allows for the strategic design of tailored interventions for each demographic cluster in order to optimize the outcome of the intervention.

In terms of the current rural development policy framework, findings of this study serve as a guideline for the formulation of an innovative developmental policy framework that leverages the growing trend of wool production in rural areas as a poverty-alleviating and job-creation strategy. Unlike other livestock commodities, wool may be harvested without harming the asset base. This characteristic of wool production makes it a sustainable and reliable household income diversification strategy. Therefore, findings of this study present a unique opportunity for the formulation of a rural development policy framework that incentivizes wool production through subsidies and population cluster-specific extension services in order to provide resource poor woolgrowers with the opportunity to participate in the mainstream wool value chain.

6.4 Recommendations for future research

The research presented is insightful in evaluating progressions in wool production, wool productivity, and herd size post implementation of the NWGA intervention to promote the commercialisation of wool production in communal areas of the Eastern Cape. In addition, the research also provides insights into which socioeconomic characteristics of woolgrowers are underlying factors influencing the progression of wool dynamics in communal areas of the Eastern Cape. However, the study has technical constraints that require addressing.

- One such constraint is the sample size of the study which, due to financial constrictions, was limited to 123 participants across the two study areas. Thus, this limited the size of the data available for analysis.
- Secondly, due to the unavailability of historic records, the data used in the study is restrictively within the parameters of a five-year period.

Therefore, it is suggested for future research that a larger, interprovincial sample composed of comprehensive data be evaluated in order to:

- Assess the evolution of wool production among beneficiaries of the NWGA intervention program between different provinces since the inception of the intervention in the 1997/98 season
- Establish unique characteristics and practices that differentiate levels of advancements in wool commercialisation in each province
- Accurately measure the contribution of communal woolgrowers to South Africa's total wool clip

Furthermore, the impact of increased wool production on household welfare is a critical area that has not been explored in current literature. Therefore, it is suggested for future research that an in-depth analysis of the relationship between improvements in wool production and household living standards be explored in order to establish the effectiveness of wool production as a rural development strategy.

As there is insufficient data relating to the characteristics of woolsheds in the Eastern Cape province, it is recommended for future research that a comprehensive data repository containing key variables of each communal woolshed sampled — such as average wool productivity, fibre diameter of output per season, as well as total wool revenue — be assembled in an open access for future exploration of the phenomena covered in this study.

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